

*Your*

An Amiga Special Publication

AUGUST 1985

90p

# COMMODORE

**YOUR BEST INDEPENDENT COMMODORE MAGAZINE**

MESSAGE

THE MONTH

WE MAKE

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**Modems - Close encounters with your 64**

**S-t-t-t-t-r-r-r-etch! BASIC on the rack**

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Be warned, this program is not a toy or game. You will need to co-ordinate your hands, eyes and mind to successfully complete each mission. Do not hope to achieve in a short time that which took the author three years to learn as a Jump Jet pilot, and over a year to record on this computer program.



Written by  
Vaughan Dow  
Jump Jet Pilot

## ANIROG

# Our COMMENT

IT'S NINE O'CLOCK IN THE MORNING. Our famous hero Adenoid Anthony is rising from bed for a day at school.

Anthony descends the stairs and walks over to his Commodore C999, switches it on and dials up his local education centre ready for the day's lessons.

You may think that all of this seems a little far-fetched. Well it isn't. It is already possible for you to link your computer to numerous other systems around the country by means of a device called a modem. Quite simply a modem takes information from one computer, transfers it into a form which can be sent down a telephone line and a modem at the other end of the call transfers this back into a form that the other computer can understand.

The 'other computer' could be one that is owned by a friend and you could be sending your latest programs to one another or it could possibly be one of the large commercial systems such as Prestel or Compuserve. Prestel is used within many companies for gathering information. You must have seen Prestel terminals in travel agents used for keeping them up to date with variable holidays. Compuserve is a system run specifically for Commodore owners and offers news, games and an area called the jungle where subscribers to the system can set up their own area and store their own programs.

So you see, Adenoid's 'school' in the home computer' is not really all that far away, you can already get access to a large amount of information over your telephone line.

In order to help you to enter this new area of computing we have a couple of features in this issue dedicated to communications on your Commodore computer.

The first article explains just what is available once you have forked out the money for a modem for your computer. There is even a list of bulletin board telephone numbers that will allow you to access computers all over Great Britain.

The second article gives details about some of the modems that are currently available for Commodore micros and explains the differences between the

cheaper and dearer modems.

Why not join Adenoid Anthony in becoming a part of this exciting new area?

## Introductions

Now it's time for the boring bit where I get a chance to introduce myself.

You may have noticed that there has been a few changes to the list of staff working on the magazine. Alison Hjal has unfortunately moved on to new pastures and I have taken over as Editor of the magazine.

Even though I am sat here at Your

Commodore HQ, I feel that this is not my magazine but rather, as it stated in the title, it is yours, the readers. In order for me to continue seeing the magazine in this way I must rely on all you Commodore owners sat at home, programming your machines and making new discoveries, to write to me here at Your Commodore, smiling in that fantastic new game that you know everyone will love to play or that great new utility that will turn your computer into the best thing since the creation of Commodore Business Machines.

So there you have it, get stuck into the magazine, have fun and don't forget I'm waiting to hear from you.





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AUGUST 1985

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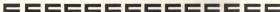
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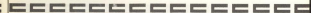
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# E- DATA STATEMENTS

## Public see the 128

The British public had its first glimpse of Commodore latest computer at the Sixth International Commodore Computer Show. The Commodore 128 was on show together with a full range of new peripherals, including a new disk drive, the 1571 which will load programs much faster than the existing 1540. The 1571 is seen as a replacement for the 1540 as it is completely compatible with the Commodore 64, although the disk drive will not work any faster than the present 1541 on this machine.

No prices were announced for the new hardware and it was also stated that there will be no price cuts made to the Commodore 64. In order to promote the 128 Commodore has announced a number of value added packs. The first of these is a '84 cassette recorder and a copy of International Forces for £199. Half of the new Commodore package will be further promoted by a special holiday offer that will give anyone purchasing a Commodore 64 or Commodore 16 three nights' free accommodation for two people at a choice of 300 hotels throughout Britain and the Continent.

As well as promoting the sales of the 128, special peripheral value packs were announced, for £129 it will be possible to

purchase a 1541 disk drive with the Commodore 1540 and a selection of disc based software. This is a saving of over £200.

A business pack is being offered, based around a Plus/4, for £449. This pack comprises of a Plus/4, a 1541 disk drive and an MPS 801 dot matrix printer. A suite of business programs, called Images 1.1.1, is also included in the price. This pack has an overall saving of £166.

Probably the most exciting item to be previewed at the show from was a sound sampling device from Music Sales, the company who produce the Commodore music keyboard. The device will allow you to sample any sound, for example a human voice, and then alter it using the computer. You could alter the pitch of the speech so that it was either higher or lower than your own, you could even play a tune on the word hello if you really wanted. The sampler is expected to be ready for launch by Christmas and will cost around £70.

Software houses launched a number of new titles at the show. Multimedia House showed Exploding Hat based around the karate games that are in the arcade. Domark showed A View To A Kill, based around the James Bond film of the same name, and Island Logic were showing their Music System a program which received much publicity at the BBC.

## Fly to the USA



IT IS THE NORM FOR AMERICAN software to be bought by British companies and launched in this country, one only has to look at the giant US Gold to prove that this works.

It is however extremely unusual to hear of a British software product to be bought by an American company for sale in the States. However, this is just what has happened to Digital Integration and its game fighter Pilot.

Digital Integration has finalised a deal with the US giant EPYC that will allow EPYC to manufacture and market the 16-bit version of the game throughout the US and Canada. The name of the program will be changed to Jet Flight Simulation.



## Gibbo jams for Virgin



TONY 'GIBBO' GIBSON THE AUTHOR of the Taitojet games Jammin', Boss's Night Out and beside special has quit the Brillington based company and licensed his latest game to Virgin.

The new game, *Chromoblaster* was produced by Gibbo and his partner Mark Harrison. Both of them are very big music fans, as reflected in earlier games, and have produced what can only be described as Musical Arcade Adventure. In fact there is so much music in the game that a special synthesizer was designed for them to work on.

In the game you play the part of Rockin' Rodney, last seen on a flashing spot somewhere in the game Jammin', as a messenger for Incentric Records. Rodney must run around Funky Town collecting demo tapes which are for possible release. For some unknown reason Rodney also has the task of making the locals dance.

The game contains 12 original pieces of music and the graphics are extremely reminiscent of Golden Taitojet games.



## What Next?

**Q.** When is a game not a game?

**A.** When it's called Web Runner the latest program from the Activision stable.

Web Runner is described as a musical fantasy of light, colour and sound. The aim of the game is to traverse a web pattern and freeze a number of objects that are moving around it. The difficulty is deciding whether or not it is a game stems from the fact that there are no lives and no points scored. Whatever, said? Computer games without a computer!

Web Runner should be available in your local computer store and will cost £18.95.

## U.S. Gold go to Disneyland

U.S. Gold, Ocean and Walt Disney Productions have finalised a deal that will give the British companies a license to create computer programs for the forthcoming Walt Disney films Return to Oz, the sequel to the Wizard of Oz, and The Black Cauldron, a film which Disney are expected to spend around £250,000 on the advertising alone. As well as producing games for the new films, U.S. Gold and Ocean have been commissioned to produce a game based around that old favourite the Jungle Book.

It would also appear that U.S. Gold is being allowed to use many of the other popular characters from Disney films including Mickey Mouse, Donald Duck, and Winnie the Pooh.

In addition to the agreement that will allow U.S. Gold to use these World famous characters, U.S. Gold will also have the rights to the current range of Walt Disney titles. The first three to be released are:

'Mickey's Space Adventure' which is described as an adventure game through

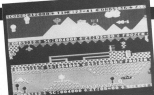
our solar system for ages of 8 years upwards, 'Winnie the Pooh in the Hundred Acre Wood' another adventure for children aged 7 years and up and 'Donald Duck's Playground' which aims to teach the skills of matching items, making money and change making.

These products are marketed in the U.S. by Sierra On-Line and U.S. Gold hope to have them available on the market by Christmas 1985.

## A timeslip for English Software

ENGLISH SOFTWARE, A COMPANY THAT became established by producing software for the old Atari computers has just launched its first game for the Commodore C16/Plus 4. The game, called Timeslip, features what English software claims unique game design, whatever that may be and, a way split screen scrolling action for one player.

Each of the split-screen sections is 15 screens wide, all of them different, and all fitting into just 16K. Timeslip will cost \$5.95.



## Summer Madness

You can definitely tell that it is summer just by looking at the latest games available from Activision. All three of them are computer simulations of sports.

On-court tennis will keep all you Wimbledon fans happy. You can choose from four players, all supposedly patterned from real life tennis players, and the type of court that you wish to play on. I just hope we don't have any displays of foul behavior from the stars.

Star league baseball brings the excitement of this American game into your living room. Options to play against another human player or the very tough computer player should keep all the family happy.

Fans of the American version of football are catered for with Cleveland football. This game allows you to play this extremely violent sport within the safety of your own home.



## Superman visits Great Britain

MAXIMILITH-TIMELESS SOFTWARE WILL be launching a new adventure game based around that well loved superhero Superman.

The adventure game is being produced in close association with America's first star who are part of the Warner Communications Group.

What Maximilith Timeless software claims to be a unique concept called 'authoring' has been used in writing the game. This system allows the games and graphics designers to create superbly animated cartoon graphics.

Maximilith are due to launch their debut title.

Maximilith's first title should just be appearing on the market these are the Munch's Rite and Quake Mine One.





## COMMODORE 64



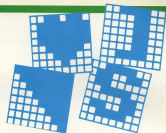
"STAFF OF KARNATH" and "ULTIMATE" recommended retail price £9.95 inc VAT. Available from W.H. SMITHS, BOOKS, J. MEAKES, WOODMORTONS and all good software retail outlets. Also available from ULTIMATE PLAY THE GAME, The Green, Ashby-de-la-Zouch, Leicestershire LE6 5JU (VAT are included) Tel: 0530 411483

Listings will be much easier to enter with our new system.

COMMODORE LISTINGS ARE RATHER well known for the horrible little black blocks that always abound. Unfortunately the graphics characters which are used to represent graphic and control characters do not reproduce very well and they are also difficult to find on the Commodore keyboard.

For this reason Your Commodore started to precede any control characters with a REM statement on the previous line that explained exactly what the black blocks were meant to be. Unfortunately the graphics characters were not documented and these still cause some confusion. For this reason we are starting to use a new method for marking the control and graphic characters in our listings.

In future all control and graphics commands will be replaced by mnemonic within square brackets. This mnemonic is not typed out as printed in the magazine but rather the corresponding key or keys on the keyboard are pressed. For example [RIGHT] means press the cursor right key, you do not type in [RIGHT]. All of the keywords, what keys to press, and how they are shown on the screen are shown below.



# LISTINGS

Any character that is accessed by pressing shift and letter will be printed as [x LETTER]

[x A]  
[x C]

shift and A  
shift & C

Any character that is accessed by pressing the Commodore key and a letter will be printed as [x LETTER]

[x A]  
[x C]

Commodore & A  
Commodore & C

[x 1]

Commodore & 1

Any control key will be printed out as a number. For example [001]. Control codes are accessed by pressing the CTRL and a letter at the same time [001] is CTRL & A, [002] is CTRL & B etc. See the manual for more information about control codes.

[001]  
[002]

CTRL & A  
CTRL & B

| Mnemonic | Symbol | what to press      |
|----------|--------|--------------------|
| [RIGHT]  |        | left/right         |
| [LEFT]   |        | shift left/right   |
| [UP]     |        | Shift & up<br>down |
| [DOWN]   |        | up/down            |
| [F1]     |        | F1                 |
| [F2]     |        | shift & F1         |
| [F3]     |        | F3                 |
| [F4]     |        | shift & F3         |

| Mnemonic | Symbol | what to press        |
|----------|--------|----------------------|
| [F5]     |        | F5                   |
| [F6]     |        | shift & F5           |
| [F7]     |        | F7                   |
| [F8]     |        | shift & F7           |
| [CLEAR]  |        | shift & CLR<br>/HOME |
| [HOME]   |        | CLR/HOME             |
| [F9ON]   |        | CTRL & 9             |
| [F9OFF]  |        | CTRL & 8             |

| Mnemonic | Symbol | what to press |
|----------|--------|---------------|
| [BLACK]  |        | CTRL & 1      |
| [WHITE]  |        | CTRL & 2      |
| [RED]    |        | CTRL & 3      |
| [CYAN]   |        | CTRL & 4      |
| [PURPLE] |        | CTRL & 5      |
| [GREEN]  |        | CTRL & 6      |
| [BLUE]   |        | CTRL & 7      |
| [YELLOW] |        | CTRL & 8      |



# Don't Buy another tape or disk...

... Until you've seen the low, low prices in our Price List. How does *Spy Hunter* look at £5.45, or *Lords of Midnight* at £5.95? Were the cheapest for *Megamix* at £14.95 while *Blogger goes to Hollywood* is a mere £5.95. Need we go on? There are another 300 products we could tell you about!

So what's the catch, we hear you say? How many tapes must I commit to buy in a year? The answer is none. Once you've joined our Club, for a subscription of £3, you need buy nothing!

But wait. There's more to this Club than

just the C's you'll save on software. As a member you'll receive a bi-monthly (for the benefit of ignorant non-Commodore owners that means every two months) magazine, packed with in-depth reviews (including lots of screen photos), competitions to enter, game-playing tips and lots, lots more.

Hurry now. If you apply for membership within four weeks we'll give you a £1 voucher towards your first purchase. So send off the coupon now and we'll send you our most recent magazine by return. And if you're not absolutely delighted we'll give you your money back!



## Mr. Software

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### MEMBERSHIP APPLICATION

P.C. 8/85

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# MODEM HOUSE

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P.O.A.

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| TTX 2000 (Spectrum all models)      | £129.95 |
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| IBM PC Hercules Rom                 | £57.50  |
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In this month's project, Garry Marshall shows how to develop a drawing package, complete with a Fill routine.

THERE ARE MANY TIMES WHEN YOU will need to develop illustrations for use within a program. It could be a technical picture for a design package or the backdrop for your latest game. This month we will develop a program that will make this extremely easy for you.

It is possible to draw any shape by linking a number of points together with lines. A program is to be developed that uses a cursor to indicate the points that must be joined to create a shape. This allows a 'free hand' drawing to be made but, for those with no special artistic ability, it can be employed by using the cursor to 'trace' an illustration held against the screen.

By adding the capability to fill a region with colour, the program can then be used to 'paint' a picture, providing a most satisfying utility.



Figure 1. The cursor movement keys

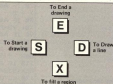


Figure 2. The keys for drawing and colouring

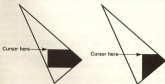


Figure 4. The way filling works

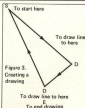


Figure 3. Creating a drawing

## Starting out

Our program must begin by setting up the high-resolution graphics screen. A sprite is then created for use as the cursor, and placed on the screen. A cross-shaped cursor will give an accurate way of finding the position of a point.

When this has been done, we can drive the program with single key presses from the keyboard. One group of keys can be used to move the cursor, and another for creating and colouring drawings. The four keys positioned in a diamond around the 'W' at the right of the keyboard form a convenient group for moving the cursor, as shown in Figure 1. The four keys shown in Figure 2, which form a diamond at the left of the keyboard, will be used for drawing and filling as indicated in that figure.

This description gives our main program as:

Set up the high-resolution screen.  
Create and position a sprite for the cursor.  
Repeat  
When a key is pressed  
If it is an "I" then move the sprite up  
If it is a "J" then move the sprite to the left  
If it is an "K" then move the sprite to the right  
If it is an "M" then move the sprite down  
If it is an "N" then start a drawing  
If it is a "O" then draw a line to this point  
If it is an "P" then end the drawing  
If it is an "Q" then fill the region with colour  
End repeat

## Writing the program

The above description converts directly to lines 10 to 120 in the program listing, giving us the main body of the program.

We have used high-resolution graphics in previous projects, and the subroutine starting at line 1000 for setting up this mode of display is one that we have used before. We have also used sprites previously. Describing the cross shape for sprite 0 and placing this sprite on the screen is done by the subroutine starting at line 2000, very similar to routines used earlier in the series. Once on the screen, the sprite is moved by lines 40 to 70, which simply increase or decrease the numbers in the registers that hold its row and column numbers.

Pressing "N" to begin a drawing causes the column and row positions of the cursor to be stored in X0 and Y0, so that the start position will be available when the drawing is to be completed. This position is then copied into X1 and Y1. To

|      |   |
|------|---|
| 1000 | To set up the high-resolution graphics screen.  |
| 2000 | To create the sprite for the cursor and place it in its initial position.   |
| 3000 | To draw an undrawn straight line. Line 3010 detects vertical lines, and lines 3080 to 3710 draw them. Line 3030 detects lines with slopes exceeding 45 degrees, and lines 3100 to 3500 draw them. |
| 3500 | To plot a point at a given row and column position. This routine is called repeatedly by the line-drawing subroutine to plot a series of points along the path of the line.                       |
| 4000 | To fill an area from the cursor to the edge of a region.  |

Figure 1

## Program Listing

```
10 GOSUB 1000: REM PREPARE HIRES SCREEN
20 GOSUB 2000: REM CREATE CURSOR SPRITE
30 GET A$: IF A$="" THEN 30
40 IF A$="I" THEN POKE 53249, PEEK(53249)
50 IF A$="J" THEN POKE 53248, PEEK(53248)
60 IF A$="K" THEN POKE 53248, PEEK(53248)
70 IF A$="M" THEN POKE 53249, PEEK(53249)
80 IF A$="N" THEN X0=PEEK(53248)-12: Y0=PEEK(53249)-40: Y1=Y0
90 IF A$="O" THEN X2=PEEK(53248)-12: Y2=PEEK(53249)-40: GOSUB 3000: X1=X2: Y1=Y2
100 IF A$="P" THEN X2=X0: Y2=Y0: GOSUB 3000
110 IF A$="Q" THEN X=PEEK(53248)-12: Y=PEEK(53249)-40: GOSUB 4000
120 GOTO 30
1000 POKE 53272, PEEK(53272) OR 0
1010 POKE 53265, PEEK(53265) OR 32
1020 FOR I=0192 TO 16191: POKE I, 0: NEXT I
1030 FOR I=1624 TO 2023: POKE I, 161: NEXT I
1040 RETURN
2000 FOR K=0 TO 60 STEP 3
2010 POKE 832+K, 0: POKE 832+K+1, 16: POKE 832+K+2, 0
2020 IF K=33 THEN POKE 832+K, 255: POKE 832+K+1, 255: POKE 832+K+2, 255
2030 NEXT K
2040 POKE 2040, 13
2050 POKE 53269, 1
2060 POKE 53267, 0
```

## Program Listing (cont.)

```

2870 POKE 53240, 140: POKE 53249, 100
2880 RETURN
3000 DX=X2-X1: DY=Y2-Y1
3010 IF DX=0 THEN 3080
3020 IF ABS(DY/DX) > 1 THEN 3130
3030 FOR C=X1 TO X2 STEP SIGN(DX)
3040 R=INT(Y1+(C-X1)*DY/DX)
3050 GOSUB 3500
3060 NEXT C
3070 RETURN
3080 C=X1
3090 FOR R=Y1 TO Y2 STEP SIGN(DY)
3100 GOSUB 3500
3110 NEXT R
3120 RETURN
3130 FOR R=Y1 TO Y2 STEP SIGN(DY)
3140 C=INT(X1+(R-Y1)*DX/DY)
3150 GOSUB 3500
3160 NEXT R
3170 RETURN
3500 RO=INT(R/8): CO=INT(C/8)
3510 L=R AND 7
3520 BIT=7 - (C AND 7)
3530 BYTE=B192 + RO*320+ CO*8+ L
3540 POKE BYTE, PEEK(BYTE) OR 2^BIT
3550 RETURN
4000 C=X: R=Y: Y=Y+1
4010 RO=INT(R/8): CO=INT(C/8)
4020 L=R AND 7
4030 BIT=7 - (C AND 7)
4040 BYTE=B192 + RO*320+ CO*8+ L
4050 IF (PEEK(BYTE) AND 2^BIT)<> 0 THEN R
RETURN
4060 POKE BYTE, PEEK(BYTE) OR 2^BIT
4070 C=C+1
4080 RO=INT(R/8): CO=INT(C/8)
4090 L=R AND 7
4100 BIT=7 - (C AND 7)
4110 BYTE=B192 + RO*320+ CO*8+ L
4120 IF (PEEK(BYTE) AND 2^BIT)<> 0 THEN 4
000
4130 POKE BYTE, PEEK(BYTE) OR 2^BIT
4140 GOTO 4070

```

get the actual screen co-ordinates we must subtract numbers from the contents of the position registers to compensate for two factors. First, the sprite position is not the same as the dot position on the high-resolution screen. Secondly, a sprite is positioned by its bottom corner, and we are taking positions from the cross-point at the centre of the sprite.

Pressing "D" moves the current position of the sprite to be stored in X2 and Y2, then a subroutine is called to a line from (X1, Y1) to (X2, Y2), and then copies X2 and Y2 into X1, Y1 ready to draw the next line. The subroutine for drawing the line starts at line 3000, and again here that we have used before, except that it has been modified to ensure that it always draws a continuous line. This will be important when we write the routine for filling a region with colour. The subroutine operates by repeatedly calling the sub-routine starting at line 3500, which simply plots a point at the current position.

Pressing "I" indicates the end of a drawing, and causes a line to be drawn from the last point to the first one, giving a drawing that consists of a closed contour. The sequence of key presses that is necessary to create a drawing is illustrated in Figure 1.

Now we come to the routine for filling a region with colour. Ideally, since the drawing part of our program always gives a closed contour, we should like to place the cursor inside a contour, to indicate the region to be coloured, and have the "painting" routine do the rest. Although this can be done, it is far from simple. The sub-routine presented here, which starts at line 4000, fills an area that extends to the right and down from the cursor position, and stops at the edge of the region. The set of area that it will fill depends on the shape of the contour, and on the position of the cursor relative to it. Two examples of what it does are shown in Figure 4.

This fairly rudimentary filling routine should provide a basis from which you can develop a better one. It can also be used in its own right to fill most of a region by using it repeatedly to fill gaps left by its previous applications.

The routine starts by drawing a horizontal line to the right from the cursor position to the edge of the region. This is why the line-drawing routine must produce continuous lines. If there are any gaps then our horizontal line will go straight through them. The program then moves the drawing position down by one line from the cursor position and draws another horizontal line to the edge of the region. It repeats this until the starting position for the next horizontal line hits the edge of the region.

Figure 5 gives a summary of the sub-routines used by the program and their actions.

*Your*

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|                 |                 |                 |
|-----------------|-----------------|-----------------|
| <b>01-00000</b> | <b>01-00000</b> | <b>01-00000</b> |
| <b>01-00000</b> | <b>01-00000</b> | <b>01-00000</b> |

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These photographs were taken immediately after the earthquake and are almost certainly correct. They appear to be of the same person.

|         |         |         |
|---------|---------|---------|
| 1. 1000 | 1. 1000 | 1. 1000 |
| 2. 1000 | 2. 1000 | 2. 1000 |

A dedicated database to allow for manipulation of names and addresses and other data. Gemini's unique "searching" system gives you a facility for "user-defined parameters" to make your own selections. Features include the facility to find a name or defined value only part of the data is known, and to print labels in a variety of user specified formats.

| COMP | Current | DEBT |
|------|---------|------|
| 1999 | 100     | 100  |
| 2000 | 100     | 100  |
| 2001 | 100     | 100  |
| 2002 | 100     | 100  |
| 2003 | 100     | 100  |
| 2004 | 100     | 100  |
| 2005 | 100     | 100  |
| 2006 | 100     | 100  |
| 2007 | 100     | 100  |
| 2008 | 100     | 100  |
| 2009 | 100     | 100  |
| 2010 | 100     | 100  |
| 2011 | 100     | 100  |
| 2012 | 100     | 100  |
| 2013 | 100     | 100  |
| 2014 | 100     | 100  |
| 2015 | 100     | 100  |
| 2016 | 100     | 100  |
| 2017 | 100     | 100  |
| 2018 | 100     | 100  |
| 2019 | 100     | 100  |
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| 2022 | 100     | 100  |
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| 2032 | 100     | 100  |
| 2033 | 100     | 100  |
| 2034 | 100     | 100  |
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**Abstract**





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Margaret Webb dons her mortar board for the start of a regular look at the

Commodore education scene.

THE ABILITY TO READ IS ONE OF OUR most important acquisitions, and it is something that many of us cannot remember learning to do. Others, however, find a very difficult exercise, which may stem from early failure leading a person to decide that he does not want to learn to read, thus closing all the experiences reading brings.

Your Commodore 64 computer can be of help in introducing your child to reading and will hopefully, keep his interest so that he is encouraged to go on learning. To help you there is a variety of software available from software houses and publishing firms.

Talking to the child about everyday events, and getting the child to talk is an important first step in learning to read. There are several games which will help you to expand on this process whilst playing games and having fun. Commodore markets two excellent packs for this step.

**Get Ready to Read with B.J. Bear** is a pack of four cassettes, a children's book and a parent's guide. Using a cuddly teddy as its central character it starts with vocabulary and memory training and works in a sure and steady way through listening and auditory discrimination to learning the letters, all the alphabet and the sounds they make. All of the games are coloured and fun to play.

**Middle and Book** by A.S.E. (again marketed by Commodore) is a pot reading vocabulary set which is based on a nursery game - which picture is missing? There are four games in the pack. The early games are very easy but as they progress more discussion is needed before an answer can be given.

Another good game of this type is **Mirrorsoft's Hit It**, in which shape, colour and size of objects is discussed. All of the above are for the 3-year old age-group upwards but it must be stressed that they need to be with an adult; the computer can only be used as a teaching aid, not as an end in itself.

Once a basic vocabulary and a rapport between parent and child is established, alphabet work can be introduced in earnest. **Let's Alphabet Games** (Good Housekeeping) and **Let's and Keys** (Applause) both keep the young child on their toes as they match and learn letters. **Let's T**, then shows the child how the letters are written whilst going on to

## Pet



GOOD HOUSEKEEPING Software



match simple words with pictures. Both these games have audio type action to help keep the child's attention.

The next stage is looking at the symbols, realising that they are words with meaning and then learning the words. One way of doing this, also used in some schools, is the flashcard method. This has been successfully transferred to the computer by a small firm, Teakdown, using lots of familiar everyday words with colourful animated illustrations. One edition is based upon the Collins Picture reading series, a favourite first reading scheme used in some schools.

Once over the initial handling of alphabet and first word learning it is useful to show the child where his reading can be. This can, of course be done with conventional books, however the computer's graphics capabilities add another dimension. **Alphabet** has a delightful package of cassettes and books called **Casars Travels** which is the best. The cassette is an animated storybook in which the child reads part of the story and then decides which option to take to continue the story. The book included in the pack has the same stories and some beautiful illustrations for the child to colour. As there are about twenty different endings to the story the pack can be used time after time.

**Mr. T's Jungle Monkey** is a double-sided cassette. On one side is the story of animals moving through the jungle to reach a raft floating down the river. The reader decides how the animals move and then determines whether the animal reaches the raft or falls in the river.

**Jungle Challenge** lets the child build up a story choosing characters, setting etc., and then explains the story to the child to read, such games are well structured and have amazing word effects.

In recap, there are four basic steps in learning to read:

- 1 Vocabulary building and memory training. Talk to your child at every opportunity - even the small baby will benefit from conversation.
- 2 Alphabet recognition and learning the sounds that go with each letter. Remember it is the sound and not the letter's name that counts.
- 3 First words.
- 4 Using what has been learnt to read a story.

Overall make learning fun. Take it in short sessions at a pace to suit your child; too much pressure can lead to early failure and so defeat the object. Once these steps have been worked through your child should have a foundation on which to build and hopefully he will discover the joy of reading and will want to learn more.

# Software Spotlight

## Spooks

★★★★

Mastertronic

£12.95

CMS 64 and joystick (optional)

RELEASED AS ANOTHER IN THEIR LINE of 'Poker money' games, Spooks from Mastertronic is an arcade adventure game maze game with elements of 'Pac-man'. You move a little man around a scrolling maze, picking up and using various objects that are lying around while avoiding the ghosts which of course bring instant death. The object of all this action is a search for the Death March, bits of which are trapped inside eight musical boxes within the maze.

Having collected the whole tune you then take it to the exit and play it to win. This is not as easy as you might imagine as many of the objects you will find are useful whilst others are actively harmful, there being no way of finding out which is which other than by trial and error.

If the game seems a little morbid this is offset by a colourful screen display of, admittedly, low-res graphics. Although the program may not appeal to dedicated arcade players I feel that it caters well for



the market at which it is aimed and should provide the younger sector with hours of fun.

One last comment, the loading screen is one of the best I've yet seen, almost worth buying the program for.

D.J.T.

## Fourth Encounter

★★★★

Sparks/Thorn EMI

£12.95

Vic 20/48, Expansion

FOURTH ENCOUNTER IS YET ANOTHER zap-a-thing-in-a-light game for software-starved VIC owners. As it stands though it is quite a good shoot out, although hardly original.

The cassette inlay instructions waffle about a 'power crazy alien force' trying to overrun your planet and turn the inhabitants into slaves. This alien force is sending the obligatory wave after wave of nasties for you to do battle with.

There are various game options which can be selected from the main menu. These include one or two player games, skill level, one phase game. The latter option allowing you to practice any of the first four levels.

The aliens come in various forms and most of them have irregular movement patterns. Your ship can move left and right on lower levels but can also move up and down on later ones, and of course it can fire missiles.

Well, that about all I can really say about this game. Nothing original whilst ordinary graphics and the usual 'zap/pow' sound effects. I should think VIC owners are fed up with shoot 'em ups by now.

P.B.B.

## Theatre Europe

★★★★

P.B.S.

£19.95

CMS 64 - joystick

LET IT BE KNOWN HERE AND NOW that I am and have been for more than twenty years a confirmed wargamer, and shall continue to be so until I can no longer move the pieces. With this in mind it should be apparent that any war simulation game will come under extreme scrutiny and severe criticism from yours truly, it will have to be good to get past me!

Theatre Europe from Coventry based P.B.S. is an awe-inspiring piece of software, superbly packaged in a large video type case, the game comes complete with fictional news sheet to set the scene, colour map of the battle area and a disconcerting this instruction booklet, all of the best quality.

The game itself purports to be "The ultimate conflict simulation" and is set in Europe in October 1918. The object of the game is to either defend or overrun West Germany, depending if you play N.A.T.O.

or Warsaw Pact. Although the battle map stretches from Spain to Moscow the actual action only really runs down the East/West German border, it is possible to move to other countries, but as the game depends on who controls Bonn after 50 days, movement away from Germany is pointless.

Once loaded up you're first confronted with the Playing options, NATO or Russian, skill level etc, after this comes the playing area/map, complete with all pieces in position, there's no alternative start positions. As with a lot of wargames you proceed to play in game phases ie, phase one of turn one is NATO equipment, phase two is NATO attack etc, then the computer has it's turn (no two player computer has it's turn (no two player option here)). Under your control are all your land based units, all the Allied Air forces and of course the tactical nuclear option, which is what this game is all about. Running across the top of the game map is the Top Line, where game messages, information etc is displayed. Movement of your forces is by joystick, as is the allocation of reserves and reinforcements, this system works very well.

This is a strategy game through and through, you will have to think your way

to victory every step of the way. To appear the arcade frills there is a little battle sequence where you can fire guided missiles at the oncoming enemy, but this screen really adds nothing to the game and can easily be omitted without loss.

Critically the display is very strong without being brilliant so is the sound, but both pale into insignificance when compared to the overall concept and playability of the game, without doubt Theatre Europe is streets ahead of its nearest rivals, the impact when you are finally forced to hit the "PAUSE" button has to be seen to be believed. A review of this size cannot hope to do this game justice.

Theatre Europe isn't perfect, on one occasion the game "hangs" for no apparent reason forcing a re-load, a two player option I would have thought was a must and the lack of any other scenario all go against it, but still P.B.S. have the best game of it's type around.

Any serious wargamer must get a copy of this at any cost, and unless the way don't forget to have your telephone next to you when you hit that pause button, you'll need it, and FAST!

Five stars absolutely no question.

M.T.H.





**Rockman**  
\* \* \* \* \*  
Mastertronic  
£1.99  
VIC 20 Unexpanded

ONE OF THE BEST GAMES FOR THE Commodore 64 is 'Rockbros'. Now a very similar game has arrived for the unexpanded VIC. Rockman is an excellent version of this very popular game.

The instructions for this game include a very complex little story which is irrelevant to the actual game. Briefly, it seems that your entire back in your country only to find your father has been murdered by his younger brother. He has then managed to convince your people into believing he is their king. Your only hope is to ask 'the Elden' for help. All they do is send you into some caves to retrieve 16 pieces of a magical Amulet. There are 16 pieces in each cave making 26 caves in all.

In the actual game collecting the pieces of the Amulet is far from easy. Each cave has a different layout of rocks in it. The rocks are supported by earth which you as Rockman can dig away. Also inhabiting the caves are nasty little creatures which follow you round the paths you dig. However, a careful push of a rock onto its head will rid you of it. Once you have collected the 16 pieces in that cave you can head for the exit to the next.

The graphics are all double height and an expanded screen is used. They are all well defined and animated. The sound is also very good although the rendition of 'Papaert' is a little out of key.

This is an incredible game. The programmer deserves a medal for the sheer variety in screens, graphics, sound effects and playability. There is even a title screen and all is £1.99 of money! Superb.

P.R.B.

**Kikstart**  
\* \* \*  
Mastertronic  
£1.99  
C64 64 + joystick (optional)

ARE THERE ANY EDDIE BOYS OR DAVID Taylor's out there? After playing this game for hours I still can't stay on the bike for more than a few seconds at a time and I feel sure that the skills of the riders mentioned are required to do anything other than fall off!

At first glance the graphics are not very inspiring, but as you play the game and notice the realistic way in which your man falls to the ground you begin to appreciate the complexity of the program.

You control a stunt motorcyclist over a wide variety of obstacles ranging from jumps over water, vehicles and telephone booths to rough riding over potholes and through hedges. That is 'you' may control the rider, I failed miserably to do anything of the sort and found the game to be very difficult.

The program caters for two players by the neat inclusion of a split screen as in RITSTOP 2, player one using the top half. There are eight different sections on which to try your skill, three of which, together make up one game.

The introduction of software of this quality at such a realistic price can only be applauded and should go some way to discouraging piracy. Surely most people can afford a couple of quid for an original game. Well done Mastertronic. D.L.T.



**BMX Racers**  
\* \* \*  
Mastertronic  
£1.99  
Commodore 16 or Plus/4

PUR ON YOUR CRASH HELMET AND hold on tight, because there is nothing slow or tame about this budget-priced game from Mastertronic!

Your aim is to complete a sequence of five obstacle courses, avoiding the hazards and collecting marker-flags as you go. If you miss a single flag you cannot complete the course. At the same time your energy is falling, but this can be replenished by picking up energy pedalling the way. You are able to jump and manoeuvre rapidly - the only thing you can't do is travel slowly! Lightning reflexes and iron nerves will be needed if you intend to complete the course and win the gold cup.

The quality of C64 games is improving all the time, and this is a very worthy offering, especially at only £1.99. The graphics are colourful and detailed, with very smooth vertical scrolling, and the sound effects are interesting. This is not just a translation of Mastertronic's game of the same name for the C64. This one is far superior and well worth buying. Don't expect to finish it in a hurry, though. After several hours play it hasn't still not gone further than course 2!

P.R.B.

# Software Spotlight

## Super Pipeline II

Taito  
£8.95 cassette, £11.95 disc  
CIB 84

A NEW GAME FROM TAITO is always worth waiting for and this is no exception, although it is not really original. As Foreman Fred you have to protect a series of water pipes into the barrels at the bottom are full. You are assisted by a supply of workmen who, cynically, are completely expendable and may be sacrificed to save yourself.

All the features of the original Super Pipeline have been kept, including its nightmare-like quality. Now, however, the nightmare has become more intense as there are constant attacks from scores of badmen! Some make leaks in the pipe; others are difficult or impossible to kill. You race around, collecting workmen to repair leaks and shooting everything that moves! The game is much faster and more challenging than the original.

It is impossible to fault Taito for the sheer professionalism of their games. The graphics are excellent, showing the full potential of sprites, and the musical soundtrack is quite superb. If you already own Pipeline I, you may think £8.95 too much to pay for what amounts to an upgrade. If you don't, then this is a game you must try to buy!

P.R.E.



## R.I.P.

Mastertronic  
£1.99  
VIC 200 Unexpanded

THIS GAME IS VERY SIMILAR IN DESIGN and concept to mastertronic's other title for the VIC called 'Rockman'. However it is still a very good game and a great test of programming in limited memory space.

You must enter the 'Crypts of Darkness' and recover the 20 chalices of truth which have been stolen from your King. Once all the pieces have been found and assembled, then all evil will be banished from the Kingdom. There are twenty Crypts in all, each containing one piece of the Chalice. Guarding the Crypts



are a number of nasties which make your task far from easy.

As with 'Rockman' some very effective data compression routines have been used to give the player as much variety as possible in 32K of memory. The twenty Crypts are all different and contain different numbers of nasties and passage ways. Some screens appear as mazes, some in the form of skulls or outlines of men.

Graphics are all well defined and are in double height on an expanded screen. Sound is also quite good and fairly varied.

Despite the similarities between this and 'Rockman' it is still worth a look especially at the superb price. VIC software is very low on the ground nowadays and I just wished it was all as good as this. Cheap but not nasty.

P.R.E.



## Master of the Lamp

Activision  
£1.99  
Commodore 64 - joystick

NO, IT'S NOT A COMPUTER VERSION of Aladdin but a new and rather unusual game, in which a series of evil gnomes have to be captured and shoved back into their lamps.

In case you are not familiar with the ancient oriental art of genie-bottling, let me put you in the picture. Two stages are involved. First you fly rapidly on a magic carpet through a tunnel which wriggles about all over the place. Then you have to inflict a succession of coloured gongs in

the correct order, to neutralise matching musical notes which the genie throws at you. They really are ingenious gnomes!

The game is original and requires several skills. Flying through the tunnels calls for very rapid manipulation of the joystick, while, as well as speed, a good memory will be needed to hit the right gongs. On the higher levels the colours disappear and you rely entirely on your ear for music! If you fail, you are not killed but have to start again on the same level. This can become tedious.

The game's graphics are good and there is an excellent sound track. However, there is little real variety, so I fear it might quickly become boring. An interesting idea, but not sufficiently developed.

P.R.E.

## Jonah Barrington's Squash

★★★★  
Home Generation Software  
£7.95  
CIBAI 64

WITH THE AMOUNT OF TIME I actually spend on the squash court apparently in the name of fitness, probably the last thing I need is a simulator for the computer. But then perhaps the best thing I could have is a few tips from one of the all time masters like Jonah Barrington.

Needless to say this is an excellent game which follows, as closely as possible, the proper rules of square and represents them on screen with brilliant graphics. So on with the action.

You can choose a one, three or five game match as well as the spot of the ball you play with ranging from red, which is easy, through blue and white to yellow, which is hard.

Naturally squash is a two player game and you also have the choice of playing against the computer itself or a human and perhaps more fallible opponent. But then the computer player is not adverse to being man-ended: the computer is remarkably fair in this respect. Well at least as any computer can be!

Surprisingly the game doesn't have to be played using a joystick, although it is easier. Full movement around the court can be achieved through the keyboard using keys which you can designate. Whether you play a back hand or a fore hand depends on your position relative to the ball. To actually strike the ball you simply use the fire button and the angle at which you strike the ball varies according to how long you hold the button down. There are six different angles at which the ball can fly from the racket.

With the addictiveness of the game, I guess my fitness is going to begin to suffer from this more sedentary style of game!

R.M.



## Grubby's Day Out

★★★★  
Home Generation  
£7.95  
Commodore 64 + joystick

AS GRUBBY-GRUBBY, YOU PLAY A creature of enormous brawn power, type-casting, do I hear you say? In fact you are an odd-looking, one legged fragile animal, but very endearing for all that!

The scene is set on your home planet of Blagor - a strange land of floating islands with deadly rocks and plants, shrouded in an energy web designed to contain the wicked leon. You, as Grubby, have a lot of trouble with your children, the Grubbles, who keep wandering off into dangerous places. Your task is to rescue them from peril by carrying them back to your cave. To move, you bounce along the ground but you can also levitate and fly, using the immense power of your mind.

Despite the silly name, this is one of the best and most original games I have seen recently. The graphics are bold and colourful, while Grubby's temperamental antics and the Grubbles are really amusing. The sound effects are excellent and real skill is needed to avoid the many hazards. There are sixteen screens, each showing a different area of the planet's surface.

Real is not born for loading difficulties, and the lack of a score table, I would have given the game five stars. Even so I recommend it very highly - a first rate game!

P.B.B.

A GRAPHICALLY EXCELLENT PICTURE, almost a photograph, of a helicopter appears on screen during loading, giving some clue as to what this game is about.

The aim is to pilot a helicopter, gathering up supplies and equipment for the good guys and delivering them to bases while at the same time avoiding enemy gunfire. It also helps it, in idle moments, a few depth charges are aimed at numerous submarines carrying enemy reinforcements.

Nothing special really and on first playing the game did disappear as the object was more too clear. Clarity soon returned by opting for a low skill level (there are ten in all) and although graphics and sound were hardly Minisquelike the game did require a fair bit of dexterity with the old wire and trigger fingers.

Quite a pleasant romp all in all with well defined if slightly jerky graphics showing the land bases, sea and numerous combatants both afloat and afoot. Search could be adapted to personal taste with a joystick controlled option before each game.

Skypet features about six different screens of ascending complexity but



overall the game was not compelling enough to persevere through the progressive levels. It was though a typical Mastertronic game, well produced with no pretensions but including a few features usually carried by only the more expensive games. Good value at the price.

R.M.

# Software Spotlight

## Operation Whirlwind

★★★★  
Aristocrat  
\$19.95 (cassette) \$24.95 (disk)  
C64K + joystick

AT LONG LAST REAL WARGAME simulations are beginning to appear, and we've had *Combat Commander* for some time and for those among us who can afford the \$49+ asking price there are the unbeatable 5M games from America. However reasonably priced good quality wargames just don't exist, and now that is, for Aristocrat have come to our rescue by bringing Bradburn's *Operation Whirlwind* out at a decent price.

*Whirlwind* is a graphic WMD strategy simulation, you are the Battalion Commander of an armoured task force ordered to take and hold a city fifteen kilometers away. Between you and it are two firms and a numerically superior enemy.

## OPERATION WHIRLWIND



FIGURE A

The first thing you are asked to do after loading is to input one of four skill levels from introductory to advanced, then you're into the game with vengeance. As usual with wargames the game turns are divided into phases, Command, Movement, Combat, Assault Order and Assault. Control of your tanks, tank armor and infantry is by joystick, position the cursor over the piece press the fire button to pick up the unit, move

and fire again to drop the piece in the required position.

Throughout the game the enemy's units remain invisible to you until they fire, by then of course it's too late. The battle area scrolls sideways as you move so that you are not limited to just one screen. The background graphics are really fine, clear, just enough to look realistic and spare enough to give your brainroom to maneuver. The pieces themselves are rather small and can be difficult to differentiate at first but after about 30 minutes play you soon get the hang of them. Sound is naturally rather limited, but it will do when called for.

*Operation Whirlwind* is fast, looks nice, plays very very well and keeps you coming back for more time after time. There is however one hidden, enormous, unchangeable BUG. Aristocrat should be told that even with today's sophisticated weapons, shells do not go round corners, in all my years of wargaming I've never hit a tank in the rear while facing its front, not until I played C&W, that is. However don't let this desert you from buying this excellent game, almost full marks.

M.T.J.

## Tower of Evil

★★★★  
Creative Sparks  
\$5.95  
C64K, 64, joystick or keyboard

IMPRISONED ON THE TOP FLOOR OF an eight-story tower is a beautiful prisoner - whose name is Diana, no less! The building belongs to a wicked necromancer and is protected by a bewildering array of evil minions, glorying in such names as Valtors and Daphonets. They have only one aim, which is to put paid to you, once and for all!

Fortunately, you are not defenceless - you are able to hurl fireballs from your



fingertips as you race from room to room. On each floor, you have to find a key to get you up the stairs to the next story. The trouble is that the baddies tend to lurk in doorways waiting for you. Occasionally, however, you come across a magic goblet, which makes you invisible for a time. There are also piles of gold, which score highly and give you bonus points when you reach the top floor.

This is a fairly straight translation of an earlier game for the 16K VIC-20. Few changes have been made but the graphics are rather more detailed. Plus'd corners should note that this game, like one or two others for the C64, will not run on their machines.

It is a good, solid sort of game, and worth adding to your collection.

P.B.B.

## Hidon

★★★★  
Orpheus  
\$5.95  
C64K 64 + joystick or keyboard

HIDON IS A FRIENDLY LITTLE GAME in which you are a fairy - although it is split into so as not to appear naive!

Your task is to fly around the magic forest in search of seven lost potions. The forest glades take the form of an

enormous number of interconnecting chambers, in which the walls, ceilings, plants and moving objects are all dangerous. Any contact diminishes your magic energy. Occasionally you find magic dust, which scores bonus points and replenishes your power. There are also lucky charms, which are worth collecting, though you can only carry three of them. Having found the potions, you must take them to the seven flowers of Firema to make them bloom.

To add interest, some of the chambers

are in pitch darkness, with just the eyes of tree spirits shining occasionally. There are very troublesome as you can bump into hazards and lose energy, without realising they are there. In other caverns four-headed block the doorways. Touching one of these makes you bounce all over the place - and on one occasion caused the program to crash!

The game is pleasant but, despite the fairy element, there is nothing very new or interesting about it.

P.B.B.

## Parky and the Yellow Submarine

\*\*\*  
\$9.95  
CBM 64

I'VE HEARD SO MUCH ABOUT THE YELLOW Submarine as the Magical Mystery Tour that this game involves. Picture the scenario. Here's this little penguin called Parky who has lost his twin brother Perry in the depths of the South Atlantic subterranean caverns. But like all South Atlantic rescue missions there are plenty of hazards to make the task difficult. Who said it was going to be easy anyway! To make it even worse you can reduce the number of lives you're allowed as well.

Lives are lost by causing Parky to bump into the cavern walls and by failing to avoid the underground nasties. There are also three different skill levels. The higher the skill level, the bigger your starting bonus which gradually ticks away as you move around the caverns.

Dotted around the caverns are plates of fish and chips to give you extra energy and bonus points, lanterns to make Parky invisible and smart bombs which can be used to destroy all the nasties in a cavern.

So much for the positive points. But then I haven't told you that there are 99 caverns to search, that there are closed doors that can only be opened with the right colour keys and the three parts of the mysterious Yellow Submarine have to be found before Perry can be rescued.

Oh I almost forgot the special 'help' factor. Collect all the letters in the right order and all the bombs, lanterns and fish mappers in all of the caverns just in case Parky needs them. Just in case Parky feels a little disoriented the package contains a map of the caverns, which, if used to plot the positions of all the items, could win you a free copy of Parky's next adventure.

Just hope it's in the warmer climes of the South Pacific. **B.M.**



## Bounty Bob Strikes Back

\*\*\*  
US Gold  
\$1.95 (cassette) \$14.95 (disk)  
CBM 64 and joystick

RELEASED UNDER THE ALL ENVELOPING U.S. Gold Label, Bounty Bob is billed as a sequel to Miner 2049er and as such finds Bob once again jumping from platforms to platforms in a vain attempt to escape the mine, 'sound familiar' it should do as in the main, the game follows the well-worn format of all platform games.

In all fairness the author has added a mass of facilities by which the program can be tailored to ones individual tastes, difficulty level, number of lives, etc. Unfortunately these parameters are



selected with joystick port 2 while the game is played with port 1 which means that either you use two 'sticks' or you change ports without powering down not to be recommended.

There are twenty five screens, at least that's what the 'burb' says, the panel of letters were unable to achieve better than level five.

Each level requires the manipulation of a piece of machinery. For example, screen one requires the use of a matter transmitter, screen two a lift and screen three a suction tube. With graphics that are adequate rather than amazing, good sound and a high score table to amuse, the program would have got a higher rating if it had been a port or two cheaper, as it is I feel that it's somewhat overpriced. Run it and see what you think.

arrives at you. To dislodge them you drop cannon balls taken from one of three heaps on the wall top. As the last of the archers fall to their deaths a jewel will appear and upon retrieving this and placing it into its case, you are transported to the next screen.

Here you may take a breather as completion of level two requires agility rather than violence. Large balls hang from the top of the screen and Quaximodo must make his way to the opposite side of the walls by swinging from ball rope to ball rope in order to find the second of the three jewels.

The game makes good use of the 64, using 48K of memory, and contains adequate sound and graphics, the animation of the main character, in particular, being very good. However, not quite up to the standard that we expect from this category. **D.J.T.**

## Quaximodo

\*\*\*  
Synsoft (US Gold)  
\$9.95 (cassette) \$14.95 (disk)  
CBM 64 + joystick

U.S. GOLD ARE RELEASING MORE software than ever for the 64 and late Quaximodo is the latest in a long line of, in the main, high quality games. Unfortunately I wonder if they are perhaps rushing programs onto the market as some of their recent releases are not quite as good value as were their earlier releases.

Having loaded Quaximodo, which is on their usual very reliable fast load system, you are faced with the task of protecting Quaximodo from an army of archers who scale the wall on which he stands. Their tactic is a simple one of erecting and climbing ladders whilst firing



# Software Spotlight

## Taskmaster

Sparklens/Thorn EMI  
£2.99  
CIBM 64

ONCE UPON A TIME THERE LIVED A beautiful Princess. There also lived a very bold young man who travelled to the strange land where this very Princess lived. The young man fell in love with this Princess and asked to marry her. However the Princess' father, the King, wanted the young man to prove himself and so sent him out on seven dangerous tasks.

There also lived a computer programmer who decided to write a game around this very unoriginal plot. He wrote the game so that you could play the part of the bold adventurer on the quest of the seven tasks. Unfortunately the programmer did not make the game very playable...

Of the seven tasks I have so far managed four of them. The first task has you fighting off Zombies for a night. You must move about shooting at them to keep away their fatal touch until the sun rises.

The second task sends you into a forest in which lives a number of wicked wizards. Again you move around

shooting them. In the third task you have to collect four statues whilst avoiding off blood sucking bats. The fourth has you shooting evil Worshipers. What comes next I don't know as by this time I was getting very bored and even more frustrated.

The graphics are well done with ancient script style letters. The sprites are large and well animated. Sound however is very sparse. The instructions tell you that each task brings a new challenge. I don't agree, they all involve walking about rapping different sprites in the same way as the last screen.

Its up to you to find out if the beautiful Princess and bold young man live happily every after.

F.A.B.

## Realm of Impossibility

Atari/EMI  
Commodore 64

JUST BECAUSE SOME IDIOT CLERIC called Wottils has stolen the seven crowns of the middle kingdoms you have the rather dubious, and not especially evasive, task of searching the 10 dangerous strongholds for the crowns and get out alive.

Once inside the dungeons - which you can choose from one by one - you are chased by on-screen squiggles loosely described as zombies, snakes and orcs. These decrease your hit points if they touch you. And they do this until you die.

You want to know more? Then don't read the insert instructions, because they don't even bother to tell you that you need the flip side of the tape loaded to get the game under way. Guff eh! Well as you've probably no doubt guessed I was about as unimpressed as the graphics and signature tune were unimpressive!

K.A.L.



Atari/EMI  
Commodore 64

Atari/EMI  
Commodore 64



## Chopper

Sparklens/Thorn EMI  
£2.99  
Commodore 64

HELICOPTER GAMES SEEM TO BE getting fairly popular on the '64. What with *Armell*, *Super Huey* and various others we are getting quite a good selection. However, *Chopper* is not in the same class as most of the other games.

You are played in the pilot's seat of the latest and most deadly helicopter gunship your airforce has produced. Your mission is to destroy an enemy base built into the side of a cliff. Of course this is an almost impossible task to achieve.

The mission is made up of three sectors and a refueling stage. The first sector is a scrolling dodger's. You must tap the enemy helicopters and planes whilst avoiding their gunfire. One nasty glitch is that you cannot move up or down while you are fire-fog. The second sector is a scrolling dodger's. You must fly up and down avoiding the millions of airplanes and balloons which have suddenly inhabited the sky.

After each of the first two sectors you must dock with a large plane to refuel and gain more points. Then its on to the next sector.

The last sector is the most difficult to complete. You arrive at the cliff housing the enemy base. You have to destroy those shafts by successfully firing a bullet down them. This is far from easy as two indestructible helicopters move up and down as you do. It is very difficult to outwit these craft so that you can deliver your shots accurately.

Some nice graphics and pleasing sound effects make for a fair game. Unfortunately it all becomes competitive in the end. Various play options and a high score table don't prevent the game from becoming dull.

F.A.B.



**Ice Palace**

• •  
Creative Sparks  
\$3.95  
CBM 64 • joystick

A REAL TIME ACTION ADVENTURE SAYS the inlay card and I'm prepared to believe there are 1000 locations and seven levels of play as it says.

Ice Palace opens with atmospheric medieval music, promising much, and totally in keeping to the quest to find of finding the seven pieces of the Ice Crown hidden in the Ice Palace and guarded by the Ice Queen and her naughty vengeances.

The fact that it is played in real time soon becomes painfully apparent as I'll usually wait when time runs away at an alarming rate, mainly because moving the heroic prince about is so fiddly. While joystick forwards moves the prince forwards, left or right joystick rotates surrounding hexagonal shaped rooms. Joystick back rotates the floor. No easy darting from room to room here - three different actions may be required before moving to the next room.

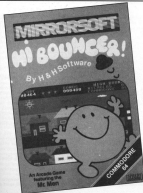


The screen displays an aerial view of the hexagonal grid showing the hero and different symbols representing artifacts, barriers and hazards. The complex movement mechanics, however, usually result in a rather odd ending with gloomy music signifying the prince's demise. Overall it's a pretty gloomy escapade.

Action can be had to an 'adventure' screen giving a menu of actions to be performed but no time is given to consider choice. A timeout this is not. As the next action is pondered a scale indicates the rising tide of the Ice Queen's hold over the adventure and before you can say 'Microprocess' or such other hallowed words, the game is lost.

While being quite appealing, the game was on the whole tedious. Too much thought seems to have been given to a movement routine quite unsuited to performing even the simplest of tasks with little consideration of how this would fit into the overall structure of a game which is really a maze game with a time limit to beat. Very few games have successfully combined the excitement of the arcade with the intrigue of adventure and Ice Palace is cold on this road.

R.M.

**Hi Bouncer!**

•  
Mirrosoft  
£8.95 cassette disk £3 extra  
CBM 64

THE FACT THAT THE MR MEN FEATURE in this game might lead you to suppose that it would be suitable for very small children, and first impressions seem to bear that out. The graphics are chunky and attractive, with bright, primary colours like a story-book, and the musical accompaniment is catchy and pleasant.

What a pity it is such a stolen game! I guarantee that any child under the age of twenty-nine will be screaming with frustration within ten minutes.

You control an unnamed Mr Men who can move left or right and jump. Your objective is different in each of the four screens but you must, at all costs, avoid contact with anything which moves or you will lose a life. Each time that happens you must wait, getting more and more irritated, while your Mr Men bounces aimlessly around the screen for what seems like half an hour!

The game is not just difficult and annoying; it is practically unplayable - yet it says on the insert that it is suitable for young children! Sorry, Mirrosoft, I suggest that you send Hi Bouncer to that happy bouncing ground for software in the sky, where it surely belongs.

P.R.B.

**Dave Crisp takes a look at  
some of the modems that are  
available for Commodore  
machines.**

# MODEM

IN GENERAL A MODEM IS A MODEM. If it works you are equal to all others. Most extra facilities (which you pay for) only make life easier once on line so even if you had to buy the cheapest available your mailless messages will look the same as the persons with \$99.99 set up.

I know of many instances where the modem has been purchased and the user has waited days for their Prestel number to arrive. Don't just sit there. Dial up a Prestel number and use the identification 444444444 and the the password 4444. This will give you access to many interesting demo pages and will allow you to get the hang of moving around Prestel. Also do not forget Bulletin Boards. There is nothing to stop you going around some of them. If you have a modem which will only use 1200/75 do not worry as more and more BBS's are using this mode.

## PRISM 1000

The Prism 1000 was dealt with a little while ago but it is worth reworking in order to let new readers see what it is all about.

It is not the most sophisticated of packages, being limited to 1200/75 and 1200/1200 but to those just starting out in communications or those who know they will be wanting slowdata services then it is quite adequate.

The Prism 1000 is certainly underfunded by switches. There are only two. One selects 1200/75 (slowdata) or 1200/1200 the other raises the line once you have dialled the computer and heard the tone.

The important part of the Prism set-up is the software which arrives with it.

The cartridge based CBI package was easy to use. Everything being more or less self explanatory. It is worth mentioning that if you have an SA-44 the cartridge will not fit and so a little 'tackling' with a Stanley knife and saw would be required to make it fit the cartridge port. The problem is the short 'neck'. It will not allow the connector to make proper contact with the socket.

When finally connected up (the instructions could have been better) and powered up, the on screen menu will enable you to get going quickly.

Presuming that you have selected a slowdata type service the procedure is as follows. Select option 0 (LOG ON/OFF). This takes you to a sub menu which allows you to auto log on, Manual log on or log off.



I may be wrong but it appeared that irrespective of whether manual or auto logging on was selected you still had to input your ID.

Once the description is made and you have input your ID, the screen clears and tells you to phone the computer.

Using the telephone dial up and wait for the tone. Once heard throw the on/off line switch down and after a few seconds contact should be made. Once the line has been raised you should be able to put down your receiver but on my set-up if I did that the line was disconnected. This left me with an open line to which all sorts of noise pollution (mainly my 3 children) had unrestricted access. I suspect though that it may be a fault at my end rather than with the modem.

The other options available from the power up menu are:

**REBANK:** This allows you to return to slowdata service after performing a function such as print frame.

**SAVE FRAME:** This enables you to save a frame to tape or disc and is useful on pages such as timetables and so on.

**VIEW FRAME:** From here you can load up a frame that has been previously saved to tape/disc.

**PRINT FRAME:** Problems here but I must tread carefully. I could not get a printout on my Casio/Compaq set up which

emulates an MP5001 and from mailboxes I have had I know quite a few people have been able to dump as an MP5001. It would appear that it is set up to print only onto a Centronics printer connected through the user port but I have a feeling that in the distant past I did get a mailbox from someone who said you could dump to the BRT. If you are out there and reading this please get in touch again as the method used would be worth putting in the mag.

**DOWNLOAD (GADGET):** This allows you to download the hopelessly small amount of software available on Prestel/Micronet. What is there appears rather dated and smothering, however for the first time I did find that downloading results were consistently good. There is a check on each frame and up to nine attempts are made to download the frame before the software alerts. I only had one failure in 18 loads.

**MAILBOX:** With this option you can prepare, offline, mailless messages to be used with either Prestel or post to user. This saves telephone time and so keeps the phone bills down. When preparing a reply to use with Prestel tone is raised the size of the page you will be sending on as it is easy to overtype and find part of your message will not fit the page.

**USER CD4444:** This allows you to connect up with other Prism users and



# MADNESS



either send/receive files, send receive mailboxes or enter CHAT MODE. Chat mode allows you to "talk" directly using the keyboard. I find though that this little used option called "speedit" is often quicker and more effective.

I only had chance to have a very quick run through user to user. The results were not very good but I suspect that the problems lay with unclean telephone lines not in the modem itself.

## In conclusion

For the money the Prim package with software seems a good buy. It is a shame that it does not support 500/500 but one cannot have everything.

I found it easy to use with only a couple of small niggles.

There is a good secondhand market in modems and so I feel that this would be a particularly good buy for the first time user. You would be able to check out communications and see if you liked it and then either sell it to upgrade or sell it and pack up.

## Miracle Technology

This is the one for anybody who loves switches and L.U.D's. The Miracle Technology modem certainly looks the part. Three Rotary Dials and 5 L.U.D's and

two tone lettering makes this look as if it will do everything. Well, it comes very close.

This one does so much that some of the options are restricted by a stop on the switch in order for it to comply with current Telecom approval specifications.

Now, I see it seems to do nearly anything. In practice my review model did virtually nothing. Why? Well when you buy the Modem that is practically all you get. On its own it could not do anything except a self test. The thing you would need to buy to get everything going is communications software.

Supplied with the Modem is an RS232C interface which plugs into the user part of the 64 and into the modem. It was there that the user port plug did not have a straight through socket as many people now have Commodore printers connected via the user port so as it stands there would be a certain amount of plugging/unplugging involved.

## The Features

On the **HARDWARE** side the WS2000 offers the following:  
 300 b/c's Full Duplex  
 600 b/c's Half Duplex  
 1200/75 b/c's Viewdata  
 75/1200 b/c's Viewdata host  
 And if you are outside the restrictions of

BT there is also **BILL 101/202** Compatibility.

There should be something there that most of you will want, I particularly like the 100/100 option. As I said on its own it is virtually useless and you will need to get terminal software in order to make use of your Modem.

I could see that if you were new to this type of thing you could end up disappointed, and somewhat poorer, if the need for comm software was not appreciated at the time of purchase. This could have been made clearer. It may be wrong but a message passed to me indicated that in future the modem may be supplied with fairly basic comm software so you could at least get going from the start.

I understand that one piece of software that goes together well with the WS2000 is the Comm software from PSL. Unfortunately this did not arrive in time for it to be used in conjunction with this modem which would have made it a more meaningful review. However if that software is as good as rumour has it then it may be worth getting it in a later edition of the magazine.

My conclusions on the WS2000 have to be drawn from the information in the manual.

It seems to offer most things and would, with the right software be a versatile tool. The documentation is fairly comprehensive but I found that it was heavy going the first time through. Of course once connected to good software most of the Modem's manual becomes redundant as options will be controlled through software.

The most unsatisfactory conclusion is that I think you would enjoy using the WS2000, but be aware of the extra hidden costs of Comm software.

## Tandem TM200

Could this be the cream of the Modems I had for review?

It did not seem quite as versatile as the WS2000 on options but where this set up shined was with the cartridge based software.

The TM200 is exactly the opposite to the WS2000. Where the WS2000 has masses of switches and wiring the TM200 has nothing. It sits by the computer, like a mysterious monolith giving no indication of what it is.

In use though it is different. It will handle 1200/75, 75/1200 and 500/500 allowing you to choose parity and so on. All under software control.

Little can be said about the Modem itself except that it is impressively silent. You could easily forget it.

Inside there is what appears to be non-volatile RAM which remembers your password and ID (optional) and stores a





lot of your time often used computer numbers. This saves much time and makes it very easy to use. No setting up just plug in and go.

No manual intervention is required to enter the line, the modem does all that. When you have dialed up you can hear through it's built-in speaker the dialling tone etc. When you have the tone it shuts off and you are away.

### The cartridge

The cartridge is the brain behind the button. Plug in and the master menu is presented.

The options are as follows.

#### 1. MODEM MENU

This takes you to the dial menu. After programming the numbers in when first used you select the computer you wish to call and the modem auto dials.

#### 2. SELECT OUTPUT DEVICE

With this you configure the disc/printer type you have. This would need to be done each time with a non-standard set up but with a T04T as device B and a Commodore type printer this option can be ignored.

#### 3. SELECT DISK FRAME

This allows you to load from tape or disc a previously stored frame.

#### 4. DISK FUNCTIONS

From here you can display a disc directory, format discs, scratch files and so on.

#### 5. LOAD AUXILIARY PACK

You can load external programs designed to run with the LANDRA cartridge. These may give you extra functions.

#### 6. EDIT NUMBER

Like the Prim modem this allows you to prepare or edit stored numbers in order to save on line time. Again the same problem of text longer than a page can be able.

#### 7. EDIT MEMORY

This is almost the same as EDIT NUMBER except that the one to be edited is resident only in memory and not stored.

#### 8. TERMINAL MODE

With this option you can enter 800/800 mode. When connected to your 88 or view-data service from terminal mode the screen will scroll and it's possible to direct output straight to the printer as well as the screen.

When you are connected to a service there is a second menu which is called the ON LINE MENU.

From here you can

#### a. SAVE CURRENT FRAME

#### b. GO OFF LINE (LOG OFF)

#### c. MIND ANCE FILE

#### d. MIND BASIC FILE

e. TOGGLE CALL TIMER. This is a built in call timer which is displayed on the bottom line of the screen. I find it very useful but it is surprising how fast the minutes click away when you are on line. For a change this clock seems quite accurate.

f. SEND EDITED FILE. This allows you to send a disc/tape based frame.

g. SEND FRAME FROM MEMORY. This allows you to send the file edited in memory.

#### h. PRINT FRAME

i. INITIAL. With this option you can display hidden Protel data, e.g. Answers to quiz questions and so on.

j. DOWNLOAD TELESOFTWARE. I had little success with this one. The Landra system requires the use of a tokenising program and repeated attempts, only resulted in failure. I shall be trying again soon.

k. SEND 800. This is almost a clear screen when on line to Protel/Minicom.

l. CLEAR MENU. This returns you to the point you were at prior to calling up this menu.

For me the Landra was the best of the three with certain reservations.

The failure of telesoftware downloading was disappointing though there is so little on PTEL/M that at the moment I can live without it. The next is the price. The T4200 must be in the luxury class, but you get what you pay for and to me it does seem a fair price for a piece of equipment with high specifications.

Having the cartridge based software and the auto-dial facility means that I could get on line very quickly with no setting up and I found that an advantage as it is not unusual for me to log on to Protel 3 or 4 times a day.

### Which one

Any of them is all I can suggest. They are all good in their different departments. Much depends on the amount you can afford to spend and your reasons for wanting to go on line.

Before I finish I think I should point out another Modem which was reviewed in an earlier issue. the PROTEK, still the cheapest on the market. I still use the Protel regularly and find it reliable. The software would still do with rewriting as you can often end up with screens full of garbage but for the person who wants a cheap but effective Protel terminal and one which is portable I still think it takes some beating.

Commodore also produce a modem for the 64. However this modem will only work in 1200/75 baud rate mode and has been covered numerous times in the magazine already. It is a good modem, it works well and you get a free subscription to Computer with it. Next month we will be looking at Computer and this modem in a greater depth.

If anybody has any snippets of information they think may help other readers or readers or printers and so on, why not leave me a message on Protel. My Protel msn number is 1864/4855. I will be pleased to hear from you.

## Get more from your Commodore 64

### The Commodore 64 Kernel and Hardware Revealed

Nick Hampshires

A knowledge of the Commodore 64 kernel software and the hardware with which it interacts is essential for all programmers wishing to make full use of the machine's capabilities. A thorough knowledge of the kernel software will give the programmer a wealth of ideas and methods for exciting programming techniques.

Also by Nick Hampshires

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**Tony Dennis explains exactly  
what you can do once you  
have bought a modem for  
your Commodore.**

BUYING A MODEM GIVES THE Commodore 64 or its 28-year cousin a wealth of information stored on mainframe computers all over the world. Sadly many enthusiasts soon become disillusioned because they cannot find any interesting telephone numbers to call. Here is a brief overview of the different telephone accessible services. Some are free - others charge for access time on the host computer. Start with the freebies and then decide what's worth paying for.

An obvious route for modem buffs is

Commodore users. At most times at least one of these will there is a free initial subscription to Minitel with the modem.

Commodore UK itself decided that its micro parties (and currently only 64 owners) should have a service of their own. Hence a got together with a computer bureau company called ADP and Compuserve was born. This service can be accessed only by those who buy the Compuserve modem (priced £299). It was pages of information like Prestel but the comments are much more sophisticated.

A list of commands is displayed at the bottom of the screen with a cursor highlighting one of them. The caller moves through the list of commands in either direction to get to the one required. It is known as a duck shoot as it is possible to rotate through the list until you arrive back at the starting point.

Compuserve also has micro news, software available for downloading and

Comunetel is now commercially available some enthusiasts have begun to use to run their own bulletin boards.

What are bulletin boards? They are messaging systems run on microcomputers by enthusiastic amateurs. When connected up to one, the caller is able to read and send messages to fellow micro-enthusiasts on virtually any topic. It is possible to send private messages to an individual as well as public ones. Most boards have Special Interest Groups (SIGs) and there's nearly always one for Commodore users. The SIGs are particularly useful for asking other people's advice on micro problems, picking up the latest gossip and news on products, and even meeting other users. Most boards have free software for downloading and some of it will undoubtedly have been left there by other kind hearted Commodore users.

Minitel, Hackney and Comunetel boards can all be accessed using Prestel

# COMMUNICAT

to subscribe to Prestel, it is run by British Telecom and was originally devised for people to access using their television sets. That is partly why the information is displayed in the format of colour pages, and virtually everything is done using the ten numerical plus asterisk and space.

Taking out a subscription to Prestel gives access to a whole bunch of databases operated by travel agents, banks, building societies and manufacturers. There are areas devoted to the legal profession, financial information such as currency and share prices, and education as well as electronic mail. For most Commodore owners, though, it is well worth taking on a Prestel subscription through Minitel. This area is part of Prestel Microcomping and therefore tailored to micro devices. Minitel has all the latest micro news, reviews, free and chargeable software on-line waiting for downloading and, of course, games. Minitel also happens to be one of the most accessed parts of Prestel with a very large base of subscribers which number roughly 75,000.

To get onto Minitel, a 1200/75 baud modem and Prestel compatible software are required. Don't worry because Minitel, Modem House, and Tandy all among others will all the necessary kit for

electronic mail. The most popular game is MUD (multi-user Dungeons & Dragons) a game that originally started on Intel University's computer. It is very much like the board game with wizards, spells and treasure to find. The difference is that the players are actually on-line together and can be calling from any part of the country. Beware because the game is so addictive that enormous phone charges can easily be run up. Century who operate the game for Compuserve also charge for playing time. Compuserve is still in its infancy and thus a much smaller database than Minitel.

Both Minitel and Compuserve can be accessed for the cost of a local call from most parts of the country. However, they both charge for subscriptions to their services. Luckily there are some services which don't. Some local authorities like Hackney have bought videodata services which have free access for the general public. They are free to look at if you live in the area or - in the case of C-View - fairly a holiday in Rochester. The SIGs provide for deprived youngsters to learn computing skills, operate videodata services, too. Both Minitel and Compuserve special interests or these boards tend to be very different.

The SIGs run software developed for the BBC known as Comunetel. These

services. There is also software available for the Compuserve modem which allows it to be used with Prestel and even includes the special Minitel downloading protocols, but bulletin boards almost inevitably require what has come to be known as 'trotting' software.

Instead of displaying information in the form of pages, instead the bulletin boards send it in a continuous stream. Thus as the screen fills up, the first lines sent begin to scroll off the bottom. In order to access such services it is therefore necessary to have what is known as a terminal program. VIP terminal is the most popular of this type of software.

Bulletin boards also operate at a different baud rate (data transmission speed) from Prestel, Minitel, etc. For this a different modem will often be needed. The cheapest is from Inteltek which includes RS232 interface, modem and software all in the same unit. With such a modem another huge group of services can be accessed.

The most popular are electronic mail services like Telecom Gold, Beryll, One-to-One and Comet. They are mainly aimed at business users since they are a very cost effective method of sending letters. Unlike bulletin boards, these electronic mail services can have hundreds of callers accessing the system

simultaneously.

Many companies which kept extensive databases on mainframe computers found that they could recoup some of the costs by making the information available on-line. In return for subscription fees which often run into hundreds of pounds it is possible to access the Financial Times service, *Herald* or *Hassard* (Parliamentary) records kept by *Lexis*.

Most such information providers are not anxious for more users to subscribe. The exception is an American company called *Dialog* which actively promotes a service for those with microcomputers. Known as *Knowledge Index*, it gives access to a whole range of databases which were considered to be of general interest. The cost is not too great, but naturally the service is only available at off-peak times, when business subscribers are not calling. The most exciting thing about *Knowledge Index* is that British

calls are actually connected via an international data switching network to *Dialog*'s computers in the USA.

Normally it is not possible to access American services direct because their modems use the Bell standard not CCITT as in England. Thus the two really exciting services for more users in the States, *CompuServe* and the *Source* are not readily available.

The way around this is to pay for a packet switching account (PSS) from British Telecom. Packet switching takes care of the difference in data protocols as well as routing less than dialling direct. To access *CompuServe* for example a British Commodore user would have to pay for the cost of a local call, the cost of PSS, plus subscription and connection charges on *CompuServe* itself. Not the thing for low income modem buffs!

North American bulletin boards use Bell frequencies but are not connected to any packet relaying service. The user will

thus need a modem which supports Bell frequencies. However, contact with our American cousins is possible via UK bulletin boards which switch to Bell frequencies at night like the *Polo* boards and *Mailbox 80* Liverpool.

Luckily most of the rest of the world uses CCITT modems like us. Enthusiasts can therefore phone boards in Europe, South Africa and even Australia. Naturally, the phone bill will be vast.

Finally, modem buffs usually come around to wanting to run their own bulletin board so that instead of making outgoing calls, everybody phones them. Currently I know of only one system which allows Commodore 64 owners to host a board and that is *Dial-a-month*. Available in the USA, it is intended as a *Landy House* service. You would need to be very lonely though because where an substantial number of people has called, disk access time becomes unacceptably slow.

Good lucking!

# ION CORNER

## UK 300 baud bulletin boards.

### CBBS systems

#### CBBS (M) SOUTH-WEST

Sysop: Boyd Hayboeck  
Phone: (0793) 57714  
24 hour operation

#### CBBS (M) LUREN

Sysop: Mike Parker  
Phone: (0462) 2324

#### CBBS (M) CHRYSTON

Sysop: Kim Hart & Alan Walker  
Phone: (07875) 28715  
21.00-06.00

#### CBBS (M) MC-NET London

Sysop: Peter Caldwell  
Phone: (071) 299-2706  
Sundays only 17.00-21.00

#### COMPUTERS INCORPORATED

Sysop: Trevor Smith  
Phone: (0207) 541059  
24 hours

### Forum-80 systems

#### Forum-80 PAUL

Sysop: Fred Brown  
Phone: (0482) 827600  
19.00-22.00 Sat & Sun  
11.00-22.00 Daily  
08.00-08.00 Bell 700

#### HAMNET PAUL

Sysop: John Laverston  
Phone: (0482) 487158  
18.00-08.00

#### FORUM-80 SPA

Sysop: Mark Bandal  
Phone: (0826) 19071  
Hours unknown

#### COMA-CO-NET

Sysop: Mr Smith  
Phone: (0482) 871216  
Hours unknown

### TRBS systems

#### TRBS LONDON

Sysop: John Nolan  
Phone: (071) 545-9408  
24 hours

### BLANDFORD BOARD

Sysop: Leo Knapp  
Phone: (0258) 54499  
24 hours

### MAILBOX-80 LIVERPOOL

Sysop: Peter Tossell  
Phone: (051) 424-9934  
24 hour operation

### MAILBOX-80 WEST MIDLANDS

Sysop: Ima Baden  
Phone: (0856) 636206  
17.30-08.30 every day

### PP SHEFFIELD

Sysop: Quentin Beckett  
Phone: (0742) 607815  
24 hours

### NORTH BRISTOLHAM B.B.

Sysop: Paul Smith  
Phone: (0827) 266770  
24 hours

### MICROWAVE

Sysop: Mike Biles/Alan McLaughlin  
Phone: (0851) 496-4757  
24 hours

# COMMUNICATION

## CARE LONDON

Synops: Tony Daniels  
Phone: (01) 571 3076  
24 hours

## MACE

Synops: Paul Beaumont  
(300 and 1200/75 service)  
24 hours

## ONSL LANCASTER

Synops: Mike Buckingham  
Phone: (0524) 60099  
11.00-10.00 daily  
1985 system with medical orientation

## MANCHESTER

Synops: Barry Branton  
Phone: (0704) 58710  
24 hours

## NBC orientated boards

### ONSL MANCHESTER

Synops: Robert O'Donnell  
Phone: (061) 427 1096  
09.00-19.00

### NBSL EAST

Synops: Jonathan Freeman  
Phone: (0603) 63018  
22.00-08.30 daily

### BUSHAM

Synops: Alan Crawford  
Phone: (0704) 720612  
16.00-20.00

### CAMBRIDGE CB

Synops: Steve Foster  
Phone: (0223) 77162  
21.00-23.00 weekdays  
11.00-17.00 weekends

### MARCTEL

Synops: Marcus Anstee  
Phone: (071) 585 7760  
19.00-22.00 daily

### SBS MATFORD

Synops: Simon Talbot  
Phone: (0623) 678844  
21.00-08.00

### MEDCHAM SBS

Synops: Martin Newham  
Phone: (07)  
24 hours

## Atari orientated boards

### ARSL WORTHING

Synops: David & Richard Harvey  
Phone: (0903) 43013  
Mon-Sat: 21.30-08.00  
Sun: 16.00-08.00

### WARRSL NEND

Synops: Dave Frost  
Phone: (0755) 842204  
21.30-24.00 daily

### ARSL BATH

Synops: Mark Templeman  
Phone: (0323) 73276  
21.00-05.00

### NOATHAM SLS

Synops: Jonathan Sander  
Phone: (0145) 571957  
24 hours

### SARSL SCOTLAND

Synops: Nick Rowett  
Phone: (0593) 668804  
24 hours

### LSRL SCOTLAND

Synops: Ray Aggott  
Phone: (0206) 38126  
24 hours

## Fido boards

### LIVERPOOL FIDO

Synops: unknown  
Phone: (0151) 245 5607  
23.00-08.00  
Bell frequency

### SYSTEM CDB

Synops: Dave Coles  
Phone: (071) 301 4770  
24 hours

## ITeCs

### STONE ITeC REMOTE CRYM

Synops: Paul Allen  
Phone: (0752) 265076  
09.00-05.00

## Let's Talk

### ARSL LONDON

Synops: Pip Conolly  
Phone: (07) 273 4307  
24 hours

## 1200/75 Baud Systems

## Bulletin boards

### CBS (B) SOUTH WEST

Exeter, Devon  
Tel: (0392) 577116  
Synops: Boyd Winkcock  
24 hours  
Also 300 baud

### CARE

London  
Tel: (01) 571 3076  
Synops: Tony Daniels  
24 hours  
Weekdays only, else 300 baud

### ENTIRE

Watson, Essex  
Tel: (0179) 447188  
Synops: SXC Electronic Services  
Office hours

### MORR

Manchester  
Tel: (061) 736 8440  
Synops: Ken Farnin  
24 hours  
Also 300 baud

## Frestel compatible systems

### ARSDEN ITeC

Tel: (0124) 441585  
24 hours

### BARSDEN ITeC

Tel: (0248) 776626  
24 hours

### PACEMAN BULLETIN

Tel: (071) 966 3312  
Synops: Machinery Borough Council  
24 hours  
Password: public

### C-VIEW

Roehampton, Essex  
Tel: (0702) 548373  
Synops: Roehampton District Council  
24 hours  
Password: public

# CORNER





David Janda takes a look at  
some programs to enhance  
your 64.

# BASIC EXTENSIONS

THERE IS A WHOLE RANGE OF BASIC language extensions available for the Commodore 64. You could be forgiven for asking why! The answer to that question is twofold. First, the Basic on the Commodore 64 is quite simply crummy. Taking into account that the 64 offers speed, colour and sound it is amazing that Commodore didn't produce a Basic to utilise these features.

Secondly, the memory map of the Commodore 64 is very flexible. Many people refer to the 64 'as being a soft' machine. This is because it is very easy to re-configure the memory map, add additional commands and so on.

In this, the first part of a two part series, I shall be taking a look at some of the extended Basics available. Please note that it would take months to cover every one, so we have selected the most popular ones currently available.

## MCT Basic — Micro Component Trading

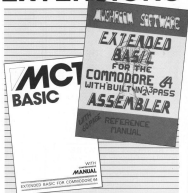
One problem faced by software houses who produce this type of all package concerns the contents. What commands do you incorporate into a Basic extension package?

The producers of MCT Basic have overcome the problem in a novel way — they have added commands and functions that are compatible with BASIC V2.5. In other words, the extra goodies based on the C64 and Plus/4.

The MCT Basic package consists of a literature style cassette holder with two cassettes and documentation. The first cassette (incorporating the Novaload system) holds the Basic extensions which include an assembler, whilst the second contains a screen painter which is written in MCT Basic. Documentation is supplied in the form of a 23 page booklet which describes (in small print) the operation of the commands in a concise manner.

The package includes extensions which cover three main areas. First there are the C64 and Plus/4 additions, next comes new Basic commands followed by programming aids.

The user interface of the screen-editor has also been changed with the addition of 17 new keyboard functions. These functions are accessed by pressing the FSC key followed by a letter and



perform operations such as line delete, screen scroll up/down and so on. The same functions can be used within a program by using the PRINT command in: PRINT CHR\$(27)CHR\$(88) Where 27 is the ASCII code for ESC and 88 is the code for a letter that performs a function.

The four standard function keys have been made more accessible by the KEY command which has two forms. Entering key in direct mode will display the current function key settings. KEY number, "aring" will assign a string to the specified function key.

A fairly comprehensive selection of graphic commands are included in MCT Basic. Five graphics modes are made available with the GRAPHIC command.

The graphics commands include CIRCLE, DRAW, CIRCLE, BOX, PAINT and so on. Eight sprite commands are included.

Programming aids include the essential: AUTO, REHLABEL, DELETE, OLD, TRON/TROFF. HELP will highlight an error in the program and TRAP/RESUME/END simply allow the programmer to trap errors — very handy when de-bugging!

MCT Basic also includes a whole set of improved and new commands. PRINT can now use USING (for screen formatting). RESPOND can be followed by a line number and NEXT can be used on the left of an argument. Added control structures include ELSE, DO, LOOP, DO UNTIL, LOOP and DO WHILE, LOOP.

It's a great pity that this package doesn't include a facility to incorporate the extensions within your own program in, without the use of the main MCT Basic resident. As it stands, MCT Basic provides a well balanced selection of commands and functions which are both useful and functional.

## EXTENDED BASIC — Mushroom Software

When I first looked at the instruction manual for Extended Basic, I thought I was looking at the BBC User Guide! The package incorporates some commands found in BBC Basic including an in-line three pass assembler.

Extended Basic from Mushroom software includes 47 new commands that are divided into 13 groups. As mentioned before, a three pass assembler is incorporated within Extended Basic, and in my opinion the package is worth buying for that alone. (Machine code files may be interesting to know that an updated version of the assembler can be purchased separately for £3.95).

The package includes quite a few commands, and it is not recommended for the absolute beginner. I can understand why, as many commands are related with each other in some way - the sprite commands being examples.

Although Extended Basic covers a variety of programming requirements, graphics and sprites are the main theme of the package.

The graphic commands merely deal with the colour settings for the paper, ink and so on. The MODE command selects the video mode and is configured as shown in table 1.

The COLOUR command within the line group will explain MODE's a little better. Basically four colours are available in MODE1. COLOUR page is used to select a physical (pin) colour from the palette of 16 and assign it to the point (pt). To actually select a colour to be used in high-res drawing the POINT command is used. Paint also has a second parameter which selects one of five boolean operators to be performed on the drawing.

Extended Basic is quite a complex package that offers numerous commands. Yet I believe it is over-complex in some areas, and also feel that the operation of some of the commands could have been implemented in a more easy to use manner.

## EXTENDED BASIC — Duckworth/Bug

A major problem associated with extended Basic is complexity. A software house will try and do better than the next one by providing more and more sophisticated commands and functions. For the novice programmer who has just learnt Basic but would like a few more commands confusion is the order of the day.

Therefore, I was relieved to see Extended Basic from Duckworth/Bug software. This cassette based package offers the user 27 new commands that

either add new features, or replace complex FORs.

The commands provided in this version of Extended Basic are simple but practical. One command is used to select the screen mode whilst another selects the graphic mode.

Colour control is achieved with just one command - COLOUR. Colour is followed by eight parameters which correspond to the colour registers with the 64.

Graphic functions include a basic PLOT command for use in both modes. The DRAW command is followed by two or more sets of co-ordinates, and draws a line between the points specified. POINT x,y will check the screen location pointed to by x and y for a colour whose number is held in variable v. In other words, it's a function that would be used as an argument within an IF statement.

To round-off the graphics side of things, TYPE will display a string of characters in both graphic modes. The user specifies the x and y co-ordinates as well as the height and width (in pixels) of each character.

I was highly impressed with the way



the sprite commands were incorporated in this package. The sprite shape is defined by using the SHAPE command. The user enters SHAPE on one line, and the following 21 lines are used to define the shape itself. Each line starts with a double-quote and whenever the foreground is to appear a '1' is inserted. The background is represented by a '0' and nothing, by nothing! Using this method enables you to instantly recognise the shape of a sprite when looking at the program listing.

SPRITE x is followed by several parameters which set the mode, colour and so on. The next two commands are very handy! SHAPE x,y will move sprite to co-ordinates x,y whilst COLLIDE x,y which checks to see if sprite x has collided with another sprite or background. The amount of the screen to be checked (in % terms) is specified by v.

It was a real pleasure using this Extended Basic. The commands are just right for the less experienced programmer and I would also recommend the package to the more experienced who wish to get some quick results.

## BASIC LIGHTNING — Osis Software

Basic Lightning from Osis software is the most comprehensive Basic extension I have used on the Commodore 64. Adapted from White Lightning — a FORTRAN based package — Basic Lightning offers over 150 commands and functions. As well as the added features, Basic Lightning allows for multi-tasking with up to five parts of a program running at the same time.

The commands cover three main

areas: graphics, sound and structured programming. Osis claims that it is possible to produce commercial quality software packages, and in general I agree.

The planned addition of a compiler later this year will mean that programs developed with this package will run independent of the main package.

Rather than attempt to describe the vast numbers of commands available in this package (just have a look at the second command(s), I will describe some of the structured programming features it

offers. Even a games programmer needs good programming structures to write fast and efficient code, and this is often overlooked by other extension writers. Thankfully, this is not the case with Basic Lightning.

The first addition is the ELSE construct, thus enabling you to say IF  $50000 < RAND THEN PRINT "GAMST" ELSE PRINT "KEEP ON TRYING"$ .

As you can see, a very handy addition. Not only that, but it is possible to "nest" ELSE's. Another form of the IF...THEN...ELSE construct is as follows:

```
10 INPUT A
20 DO A=0
30 PRINT "ERROR, TRY AGAIN"
40 GOTO 10
50 ELSE
60 PRINT "NUMBER ACCEPTED"
70 A=1
80 END
```

Basically, CASE...CASE...CASE provides a means where the IF construct can be spread out over several lines. Notice the automatic indentation for readability.

REPEAT...UNTIL is useful for setting up a loop when you don't know how many times a group of statements are to be repeated. This is because REPEAT...UNTIL works on a condition. A variation is the WHILE...REPEAT construct. The difference here is that the test is performed at the beginning of the loop.

The next item to consider is the CASE statement. Originating from the Pascal programming language, it offers a flexible means of branching given a true condition. An example from the manual demonstrates this:

```
10 INPUT A
20 CASE A
30 OF 0 : PRINT "Three friends here."
40 OF 2,3 : PRINT "Two birds close."
50 OF 1,2,3 : PRINT "And a partridge in a pear tree."
... And so on.
```

Finally, those of you who are jealous of BBC Basic's procedures need not be jealous any more! Procedures are fully supported within Basic Lightning. Parameters may be passed to and from them, local variables can be declared even whole arrays can be passed as parameters.

Basic Lightning is quite simply excellent. But be warned, it is a complex package that takes some time to understand and appreciate.

## Summary

The packages I have looked at this month are all quite good, but there are a couple of points worth bearing in mind. First, you will find it a tough job finding a package that incorporates all the features that you want. Secondly, big is not necessarily beautiful. I wouldn't, for example, recommend Basic Lightning to the absolute beginner.

Table 1 — Graphic modes supported in MCT Basic

|          |   |
|----------|---|
| GRAPHIC0 | 120 × 200 pixel high-res mode                                       |
| GRAPHIC1 | 120 × 200 pixel high-res mode                                       |
| GRAPHIC2 | As for GRAPHIC1 but with five lines of text at the bottom of screen |
| GRAPHIC3 | 160 × 200 pixel multi-colour high-res mode                          |
| GRAPHIC4 | As for GRAPHIC3 but with five lines of text at the bottom of screen |

Table 2 — Graphic modes supported in Mushrooms' Basic

|        |                                     |
|--------|-------------------------------------|
| MOOD00 | 120 × 200 high-res-graphics         |
| MOOD01 | 160 × 200 high-res four colour      |
| MOOD02 | Extended colour text mode           |
| MOOD03 | Multi-colour text mode              |
| MOOD04 | Standard text mode in power-on mode |

Table 3 — A breakdown of commands used in Mushrooms' Basic

|                  |  |
|------------------|--|
| 5 Utility        | AUTO, OFFEND, DELETE, QSD, RETURN                        |
| 5 Graphic        | BORDER, CLS, INK, MODE, PAPER                            |
| 4 Assembly       | CALL, CORDATA, PROCDON, FRIEDATA                         |
| 5 Hints          | CDC, COLOUR, DRAW, FILL, MOVE, PAINT, PLOT, STRAND, TRIM |
| 5 Sprites        | SPRANDE, MICROCL, MSHFIELD, MICROPS, SPRTIE              |
| 3 Procedure      | DEFPROC, ENDPROC, PROC                                   |
| 4 Sound          | DEFREQ, MASTER, SLD, SOUND                               |
| 3 Disc           | DIR, DIRC, REPORT  |
| 3 Structure      | ELSE, REPEAT, UNTIL                                      |
| 2 I/O            | LOADMEM, SAVEMEM   |
| 2 Other          | PAUSE, RESTORE   |
| 1 Misc           | QPI  |
| 1 Graphic/primer | COPY   |

Table 4 — Sound commands available in Basic Lightning

|           |                                       |
|-----------|---------------------------------------|
| VOLUME    | Set master volume                     |
| FREQ      | Set a frequency to specified voice    |
| ADRM      | Used to set envelope shape            |
| MUSHC     | Set the length of a note              |
| SWW       | Selects suitable waveform for a voice |
| TR        | Selects triangle waves                |
| NOISE     | Selects noise                         |
| PULS      | Produces a square wave                |
| FILTER    | Affects the timbre of a sound         |
| PASS      | Selects operation of FILTER           |
| CUTOFF    | Selects cut-off frequency             |
| RESONANCE | Makes the filter resonant             |
| RMFG      | Introduces ring modulation            |
| SYNC      | Synchronises voices                   |



[illegible]

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the 1990s, the number of people in the world who are illiterate has increased from 1.2 billion to 1.5 billion. The number of illiterate people in the world is expected to reach 1.7 billion by the year 2015. The number of illiterate people in the world is expected to reach 1.7 billion by the year 2015. The number of illiterate people in the world is expected to reach 1.7 billion by the year 2015.

[illegible][illegible][illegible]

1. **RESEARCH** (a) is a **scientific** process, (b) is a **systematic** process, (c) is a **logical** process, (d) is a **creative** process, (e) is a **critical** process, (f) is a **rigorous** process, (g) is a **thorough** process, (h) is a **comprehensive** process, (i) is a **holistic** process, (j) is a **multidisciplinary** process, (k) is a **cross-disciplinary** process, (l) is a **transdisciplinary** process, (m) is a **interdisciplinary** process, (n) is a **collaborative** process, (o) is a **team-based** process, (p) is a **open-ended** process, (q) is a **flexible** process, (r) is a **adaptable** process, (s) is a **responsive** process, (t) is a **proactive** process, (u) is a **innovative** process, (v) is a **transformative** process, (w) is a **disruptive** process, (x) is a **radical** process, (y) is a **revolutionary** process, (z) is a **paradigmatic** process.

[illegible]

**Calico**  
SOFTWARE

[illegible]

**DOI:** 10.1002/for

Statutes that require the creation of health-care proxies of all Florida citizens. The bill proposes to amend the existing law to require every citizen to create a health-care proxy. The bill also requires the creation of a health-care proxy for every citizen.

**Keywords:** child sexual abuse; disclosure; social support

DOI: 10.1002/for

[illegible]

**Figure 1**

1947-1950  
 1951-1954  
 1955-1958

This **TRANSFORM** will update your 320 disk drive to last specifications, at **Home** **Center**, and is compatible with most operating systems. **TRANSFORM** allows you greater faster better data transfer rates. **TRANSFORM** is a **TRANSFORM** technology and what we are looking for that means for disk error recovery and all this is a **TRANSFORM** technology for disk error recovery.

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 spend some time with a  
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 chance to win some time with  
 Paul McCartney.



More and more games are appearing on the market that are based around television series or films. Give My Regards to Broadstreet from Argus Press Software being an excellent example of how a good game can be made from a film plot.

Both game and film are based around Paul McCartney who is trying to find some missing sections of the master tape for his latest album. In the game you play the part of Sir McCartney and must dash around an authentic map of London trying to locate your friends to see if they have the missing pieces.

Argus Press Software are making it possible for a winner of this month's competition to spend some time with the star and author of the film Paul McCartney, teaching him how to play the game.

The prizes being offered are:  
 1st Prize, a trip to London for lunch and the chance to spend some time with Paul McCartney in his London studios.  
 Six copies of the Broadstreet album and six copies of the video.  
 Plus 50 runners up prizes of £10 of new software from the current APB range.



# COMPETITION



## What to do

Firstly you will need a copy of the computer game as all of the competition questions need quite a bit of familiarity with the game in order to answer them correctly.

If you don't already own a copy of this

game we have included a voucher that will give you £1 off of the game. All orders are to be sent to Argus Press Software at the address shown on the discount voucher.

Secondly you must sit down and play the game until you are sure that you can answer all the questions correctly.

Then fill in the competition entry form

with your answers and the validation questions in case there is a tie.

Complete the competition entry form, not forgetting the validation questions, and send your entry to Broadstreet Competitions, Four Corners Lane, 1 Golden Square, London W1R 3AB. The closing date of the competition is 31st August.



## Questions

- 1) How many people are there in the game?
- 2) What make of car does Paul drive in the game?
- 3) Where do you go after you've collected the missing notes?
- 4) What tube station does George Martin come out of after leaving Heathrow?
- 5) In the Game, which tube station shows you the Tower of London?
- 6) Which tube station do you go to to visit the Old London pub?

## Broadstreet Competition

Fill in this form as soon as you think that you know all of the answers.

[illegible]

\_\_\_\_\_

I think the answers in the explanation page

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

[illegible][illegible]

1000

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### Validation Questions

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What time of day did you finish? \_\_\_\_\_  
What was the last tube station Sandra went through? \_\_\_\_\_

**Keywords:** social support; coping strategies; depression

**Breadbasket Competition. Your Commodore, 1 Golden Square, London, W1R 3AE.**

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I would like to claim my 11% off the purchase price of Live Arts Regatta To Broadway!

I enclose a cheque/postal order for the sum of 10,000 for the reader payable to Angus Brown, Southampton.

Source: *Author's calculations*.

1000

Source: *Author's calculations*.

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| Age Group | Percentage |
|-----------|------------|
| 18-24     | ~10%       |
| 25-34     | ~15%       |
| 35-44     | ~10%       |
| 45-54     | ~10%       |
| 55-64     | ~10%       |
| 65-74     | ~15%       |
| 75+       | ~10%       |

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Make your graphics  
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routines from AP and  
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# MASTERING MACHINE CODE

SEVEN ROUTINES ARE PRESENTED here and are given in assembly language form in Program T1.1. All the routines are used by the function plotter program described in this month's BASIC FACTS article. A few loader programs, with the object code in DATA statements, is given and should ease the task of typing in the program. However, if you wish to modify or improve the routines then the Assembly language listing is the best course of action. Please make sure you SAVE the source code on tape before attempting to execute any code. A simple typing error or omission will almost certainly cause the system to crash.

## The routines

Programming high resolution graphics, using standard CBM64 BASIC, can be rather tedious. In addition, the execution speed can be painfully slow. A few simple machine code routines, of the type given in this article, are very useful in areas such as graph plotting especially if they can be called from BASIC. Figure 1 lists the available routines.

## Clearing the bit map area

Before we even start using hi-res graphics, it is necessary to clear the bit map, an 8000 byte area of memory, corresponding to a graphics screen of 320 by 200 pixels. This area is normally placed at address \$2000 (\$702 decimal) but can easily be repositioned. Clearing the bit map with a series of POKEs from BASIC would take several seconds to execute whereas, a machine code version would appear to

execute instantaneously. An example of such a routine is that of CLEARMAP (lines 500 to 590).

## Setting up screen memory

Two colours are available in low resolution mode. A one byte number is used to set up the two colours that are available. The upper nybble specifies the colour coded 0 to 15; of any pixel represented by a binary one in the bit map. The lower nybble is the colour code of any pixel represented by a binary zero. The desired combination of colours are POKEd into the location labelled SCREEN (\$E0 here or 224 decimal) prior to a call to INIT or SCREEN, for example. POKE1254,7 would specify black graphics on a yellow background. Refer to the program breakdown for details of the coding.

## The INIT ROUTINE

This routine sets up all the default bit map addresses and screen memory and calls the CLEARMAP and SCREEN routines. It is also responsible for setting up the raster interrupt SERVICE routine by resetting the interrupt IRQ vector. By using raster interrupt techniques, the screen can be split between high resolution graphics and a text window at the bottom of the screen. Before calling the INIT routine with \$E0-\$F5 it is necessary to set up a few locations. Firstly, the colour information needs to be present in location \$F6 (\$246). For testing purposes try POKE1254,7 as described above. Secondly, the position of the screen split needs to be set up in location \$80 (\$100 decimal). This should be in the range \$1 to 239 corresponding to the top and

1. CLEARMAP, a fast routine for clearing the bit map area of memory.
2. SCREEN, a routine for setting up the screen memory area with the colour information needed by the VIC-II chip.
3. PLOTBIT, a routine for lighting up any individual pixel from supplied X,Y screen coordinates.
4. VLINE, a routine for drawing a vertical line of a chosen length.
5. HLINE, a routine for drawing a horizontal line of chosen length.
6. SERVICE, this is the interrupt routine which handles split screen text and graphics windows.
7. INIT, an initialisation routine for the raster interrupt sequence. It also calls on the subroutines CLEARMAP and SCREEN.

bottom of the visible screen. A figure of \$20 (32) leaves a text window of about four lines. Try POKE12,254.

## XY coordinate plotting

According to the CBM64 programmers reference guide, the address in which the character memory dot (PLY) is located is given by:  $8192 + ROW * 128 + CHAR * 8 + LINE$ . POKE \$F7F,POKE(\$F7F) : GOTO 1 END where,  $BASE =$  the bit map start address. By default, \$2000 (\$702 decimal)  $ROW =$  INT(Y/8). The character row number 0 to 24 containing the Y coordinate.  $LINE = (Y AND 7)$ . The character line (0 to 7) which contains the Y coordinate.  $CHAR = INT(X/8)$ . The position of the character within the row which contains the X coordinate (0 to 7).

## Rearranging the equations

Obviously, the above calculations would be fairly lengthy if executed in BASIC.

Fortunately, we can rearrange the equation so that machine coding can be performed efficiently. We need to expand the equation so that, as far as possible, all multipliers and divisors are exact powers of two. This simplifies all multiplication and division to simply shifting bits to the left or right respectively. The rearrangement can be performed as follows:  
 $ADDRESS = BASE + 8096 * ROW + LINE + CHAR * 8$   
This can be expanded to:  
 $ADDRESS = BASE + 40 * (ROW * 8 + LINE) + CHAR * 8$   
 $ADDRESS = BASE + 32 * (ROW * 8 + LINE + CHAR * 2)$

By substituting the equations for ROW, LINE and CHAR and writing BASE at default \$2000 we finally arrive at:  
 $ADDRESS = $2000 + 32 * INT(Y/8/8) + 8 * INT(Y/8/8) * (Y AND 7) + 8 * INT(X/8)$

It is now relatively easy to convert the final equation to machine code. All that INT(X/8) entails is shifting Y eight times, then dividing by eight and taking the remainder plus three least significant bits of Y.





100

| 10  | 0000 | FILE-RESOLUTION GRAPHICS UTILITY |
|-----|------|----------------------------------|
| 20  | 0000 | WIDTH SPL IT SCREEN TEXT WINDOW  |
| 30  | 0000 | 000000 = 000                     |
| 40  | 0000 | 000000 = 000                     |
| 50  | 0000 | 000000 = 000                     |
| 60  | 0000 | 000000 = 000                     |
| 70  | 0000 | 0000 = 000                       |
| 80  | 0000 | LOC = 000                        |
| 90  | 0000 | STORE = 000                      |
| 000 | 0000 | SCOFFAH = 00000                  |
| 100 | 0000 | LENGTH = 00001                   |
| 110 | 0000 | SCOFFAH = 00000                  |
| 120 | 0000 | SCOFFAH = 00000                  |
| 130 | 0000 | SCOFFAH = 00000                  |
| 140 | 0000 | SCOFFAH = 00000                  |
| 150 | 0000 | SCOFFAH = 000                    |
| 160 | 0000 | SCOFFAH = 000                    |
| 170 | 0000 | SCOFFAH = 000                    |
| 180 | 0000 | 201000                           |
| 190 | 0000 | 00                               |
| 200 | 0000 | 204000                           |
| 210 | 0000 | 00                               |
| 220 | 0000 | 200100                           |
| 230 | 0000 | 00                               |
| 240 | 0000 | 200000                           |
| 250 | 0000 | 00                               |
| 260 | 0000 | 00                               |
| 270 | 0000 | 00                               |
| 280 | 0000 | 00                               |
| 290 | 0000 | 00                               |
| 300 | 0000 | 00                               |
| 310 | 0000 | 00                               |
| 320 | 0000 | 00                               |
| 330 | 0000 | 00                               |
| 340 | 0000 | 00                               |
| 350 | 0000 | 00                               |
| 360 | 0000 | 00                               |
| 370 | 0000 | 00                               |
| 380 | 0000 | 00                               |
| 390 | 0000 | 00                               |
| 400 | 0000 | 00                               |
| 410 | 0000 | 00                               |
| 420 | 0000 | 00                               |
| 430 | 0000 | 00                               |
| 440 | 0000 | 00                               |
| 450 | 0000 | 00                               |
| 460 | 0000 | 00                               |
| 470 | 0000 | 00                               |
| 480 | 0000 | 00                               |
| 490 | 0000 | 00                               |
| 500 | 0000 | 00                               |
| 510 | 0000 | 00                               |
| 520 | 0000 | 00                               |
| 530 | 0000 | 00                               |
| 540 | 0000 | 00                               |
| 550 | 0000 | 00                               |
| 560 | 0000 | 00                               |
| 570 | 0000 | 00                               |
| 580 | 0000 | 00                               |
| 590 | 0000 | 00                               |
| 600 | 0000 | 00                               |
| 610 | 0000 | 00                               |
| 620 | 0000 | 00                               |
| 630 | 0000 | 00                               |
| 640 | 0000 | 00                               |
| 650 | 0000 | 00                               |
| 660 | 0000 | 00                               |
| 670 | 0000 | 00                               |

Multiplying by 8 is then achieved by shifting the result left three times. However, there is an even simpler way of calculating INT(5/8)\*8, in essence, the above two operations simply clear the 3 least significant bits of *F*. Therefore masking out the three least significant bits of *F* with AND  $\#4$  will produce the same result. Similarly, the INT(5/16)\*8 term can be obtained by ANDing the lower byte of *F* with  $\#10$ . Remember that the specified 5 coordinate will occupy two bytes in this graphics mode (0 to 15). If the 5 coordinate is stored in locations labelled *COORD* and *COORD+1* the following code should temporarily store the low byte result in the location *STORE*.

```
LDX COORD
AND  $\#4$ 
STA STORE
```

We are even more innovative in coding the term  $LOC(Y)(X)(B)$ . This simplifies even further because logically shifting  $Y$  right three times and storing it as the high byte of the result is all that is needed. However, this is only possible because the 3 least significant bits of  $Y$  are redundant. If the  $X$  coordinate is stored in the location labelled  $LOC3RD$  follows that the result of  $LOC(Y)(X)(B)$  can always be stored in the location  $LOC1$  if the low byte is always zero. The process can be coded as follows:

LDA #0  
 LDA LOC  
 LDA PCORD  
 LSR A  
 LSR  
 XOR  
 LSR A  
 LSR A  
 LDA LOC+1

Two further shifts right of the  $(\text{H}^*(\text{INT}/5)/8)^*$  result (shifting two twice) gives  $\text{H}^*(\text{INT}/5)/8$ . The high byte of the former will still be present in the accumulator, the low-byte is always zero. This can be coded as:

LSB: A  
POCK: LDC  
LSB: A  
POCK: LDC

Notice that  $\text{EIM}$  is not strictly necessary in the result of the previous operation since it is always zero. However, by treating it for future calculation



## Program Listing (cont.)

```

1390 D000 A0
13A0 D00C
13B0 D00C 304800 HLIN
13C0 D00F 8AFC
13D0 D001 D002
13E0 D003 8AFC
13F0 D005 30
1400 D00A A001C3
1410 D00F 8701
1420 D00B 8001C3
1430 D00B 8003
1440 D00B 8001C3
1450 D00B 8003
1460 D00F 0E0003
1470 D003 A001C3 8K0F3
1480 D00F D004
1490 D00F A000C3
14A0 D00F D00F
14B0 D00F 40
14C0 D00F
14D0 D00F A00000 80F010E
14E0 C101 3900
14F0 C103 F03A
1500 C103 800000
1510 C106 A00200
1520 C108 C700
1530 C10B 7017
1540 C10F A00000 TEST
1550 C112 20FF
1560 C114 800000
1570 C117 A01100
1580 C11A 200F
1590 C11C 801100
15A0 C11F 8000
15B0 C121 801200
15C0 C124 F015
15D0 C12A A01800 HIR05
15E0 C12F 0A08
15F0 C130 801800
1600 C132 A01100
1610 C131 0920
1620 C133 801100
1630 C13A A000
1640 C13B 801200
1650 C13D 200FFF 0317
1660 C13E 2004FF
1670 C141 C700
1680 C143 F03A
1690 C145 70
16A0 C14A A921
16B0 C14B 801400
16C0 C14B A92A
16D0 C14D 801500
16E0 C150 A00000
16F0 C153 0921
1700 C15B 800000
1710 C15D 200FE
1720 C160 A993
1730 C162 2002FF
1740 C165 30
1750 C16A D007
1760 C16B 40
1770 C16F 40
1780 C16A 40
1790 C16B 4A
1800 C16C 40
1810 C16D 40
1820 C16E 40
1830 C16F 40
1840 C16F 40
1850 C16F 40
1860 C16F 40
1870 C16F 40
1880 C16F 40
1890 C16F 40
18A0 C16F 40
18B0 C16F 40
18C0 C16F 40
18D0 C16F 40
18E0 C16F 40
18F0 C16F 40
1900 C16F 40
1910 C16F 40
1920 C16F 40
1930 C16F 40
1940 C16F 40
1950 C16F 40
1960 C16F 40
1970 C16F 40
1980 C16F 40
1990 C16F 40
2000 C16F 40
2010 C16F 40

```

RTN

JBR PL0T007

LHC A00000

BHL 803F

LHC A00000+1

803

LDA LENGTH

800

81

STA LENGTH

800 803F2

DEC LENGTH+1

LDA LENGTH

800 HLIN

LDA LENGTH+1

800 HLIN

RTN

LDA 8000 F

AND 81

BHL 0317

STA 8000 F

LDA 80003

CMP 8000

BCL 80000

LDA 80000

AND 8007

STA 80000

LDA 80011

AND 800F

STA 80011

LDA 80

STA 80012

AND 0317

LDA 80010

ORA 80

STA 80010

LDA 80011

ORA 8020

STA 80011

LDA 80117

STA 80012

JBR 800007

JBR 80110

CMP 80

BCL 0317

BCL

LDA 80031

STA 4314

LDA 8000A

STA 4315

LDA 8000E

ORA 81

STA 8000E

LDA 8001A

AND 800F

STA 8001A

LDA 8003

JBR 030007

CLT

BHL TEST

PLA

TAY

PLA

TAX

PLA

RTI

Once this has been done a `SV$WH$` call will light up the pixel at the chosen screen coordinate.

## The VLIN routine

This is a very simple routine that draws a vertical line on the high resolution screen by implementing the iteration `POKE` prior to calling the `PL0T007` subroutine. Before calling, set up the following locations with legal values.

Start X coordinate low byte, location `$F8` (254).

Start X coordinate high byte, location `$FC` (255).

Start Y coordinate, location `$FD` (256).

Length of vertical line in range 1 to 300, location `$C01` (9940).

The `VLIN` routine can be called from BASIC with `SV$VHL$`.

## The HLIN routine

This is similar to above but draws a horizontal line by incrementing the X coordinate values prior to calling the `PL0T007` subroutine. The routine is slightly more complex because two bytes each are used for the lengthy information and X coordinate values. Remember that the width of the screen is 320 pixels. Before calling from BASIC with `SV$HHL$` set up the following locations with legal values.

Start X coordinate, low byte, location `$F8` (254).

Start X coordinate, high byte, location `$FC` (255).

Start Y coordinate, location `$FD` (256).

Length of horizontal line, low byte, location `$C01` (9940).

Length of horizontal line, high byte, location `$C02` (9940).

## The raster Interrupt SERVICE routine.

This is a fairly complex piece of programming to explain so is best treated in detail in the program breakdown section. The `SERVICE` routine is called each time a raster interrupt occurs this will be at the top of the screen for graphics and, say, two-thirds of the way down the screen for text.

## Program breakdown

|                    |   |   |   |
|--------------------|---|---|---|
| Lines 10 to 150    | Assigns labelled locations for convenience and ease of programming.   | length incremented. The loop ends when LENGTH has reached zero. Single byte values are used each time because the maximum number of vertical plot points is 255.  |   |
| Lines 150          | Causes assembly of location YCOORD to jump.   | Similarly calls the routine PLCTIME if a fixed number of times. Horizontal lines are drawn by incrementing XCOORD (2 bytes) and decrementing LENGTH (2 bytes). The loop is a double byte loop because the length and X coordinate values can be greater than 255. |   |
| Lines 180 to 250   | Form a jump table which calls the chosen routine and returns either to the machine-code program that called it or back to BASIC. This practice can save considerable time when modifications are made, since the routines would all have the same apparent calling addresses. Where possible, always use labels and force the assembler to do the tedious work. | Lines 1570 to 1580  | Check if bit zero of the interrupt status register is set. If it is found to be clear a branch to the location labelled EXIT occurs.  |
| Lines 270          | Disables interrupts while vectors are changed.  | Lines 1580  | Clear bit zero of the interrupt status register flag. This is the raster interrupt flag.  |
| Lines 280 to 290   | Clear the screen.   | Lines 1570 to 1580  | Check if the raster count is in high resolution area of screen when interrupt occurred. If so branch to location HRES.  |
| Lines 290 to 310   | Set the labelled location BMAPAGE to 520 which contains the default base page address of the bit map.   | Lines 1660 to 1670  | Set the next interrupt to occur to an invisible region at the top of the screen and above the displayed area.   |
| Lines 340          | Call the screen memory fill routine SCROLL.   | Line 1680   | Force a branch to EXIT at all times. Relative branch instructions are always more favoured than absolute JMP instructions, because the object code is inherently relocatable. |
| Lines 360 to 380   | Set bit zero of Control Register A (CRA) of the CIA. This in effect stops the normal keyboard scan interrupts every 1/60th of a second.   | Lines 1740 to 1760  | Set the next interrupt to occur at the position specified in the location labelled SPUT.  |
| Lines 390 to 420   | Redirect the interrupt IRQ vector to the SERVICE routine.   | Line 1770   | Call the Kernal routine SCMDTY. This is necessary because the normal keyboard scan has been disabled earlier.   |
| Lines 430 to 470   | Set the raster interrupt to occur at the position specified in the location labelled SPUT by writing to the raster register.  | Lines 1760 to 1800  | Check if a key has been pressed. If it has been, the program branches to the location GANY.   |
| Lines 480 to 500   | Drop the most significant bit from the raster count.  | Line 1810   | Disables interrupts while interrupt vectors are changed.  |
| Lines 510          | Re-enables interrupts to occur.   | Lines 1820 to 1850  | Reset the default interrupt vectors for normal interrupt operations. The normal Commodore interrupt handling routines are at location SCADR.                                  |
| Lines 540 to 580   | Clear the location LOC and produce the mask for setting the (X,Y) coordinate bit.   | Lines 1860 to 1880  | Clear bit zero of control register A of the CIA, thus restoring the normal 1/60th second keyboard scan interrupts.  |
| Lines 640 to 660   | Calculate XY coordinate address: LOC, LOC+1 (2 bytes). (See earlier text for details).  | Lines 1880 to 1910  | Disable further raster interrupts by clearing bit zero of the interrupt enable register.  |
| Lines 900 to 960   | Initialise STORE and (STORE+1) to the base address of the bit map as set in the location BMAPAGE.   | Lines 1920 to 1930  | Clear the screen.   |
| Line 970           | Set the X register, the page counter, to 515. This is set to the nearest whole number of page (256 byte blocks) to be cleared in the bit map.   | Line 1940   | Disables normal interrupts.   |
| Lines 990 to 1040  | Form a loop which clear 512 pages of memory, a page at a time, using indirect indexed addressing.   | Line 1950   | Form a branch always to location EXIT. This ensures that on termination of split screen interrupts, standard text mode is selected.   |
| Lines 1050 to 1080 | Form a loop which clears the odd 512 bytes of the bit map remaining.  | Lines 1960 to 2010  | Roll registers from the stack in the same order that the normal Commodore interrupt service routine would and return from interrupt.  |
| Lines 1110         | Load the accumulator with the combination of colour set up in the location labelled SCROLL. This can be POKEd in from BASIC as explained earlier.   |   |   |
| Lines 1160 to 1280 | Load upscreen memory locations in a similar loop structure with which the bit map was cleared.  |   |   |
| Lines 1310 to 1340 | Call the routine PLCTIME a fixed number of times within a loop to draw a vertical line. Each time round the loop the Y coordinate, YCOORD, is incremented and the   |   |   |



A.P. and D.J. Stephenson

provide a handy plotting

routine, together with a

program to make graph

plotting a little easier.

WE THOUGHT THE BEST WAY TO illustrate the use of graphics and error interrupts was to provide a full working program for plotting the graph of any function. We could have concentrated on games graphics but so much has already been written on the subject. Anyway, the Commodore 64 deserves a change sometimes.

It is comparatively easy to use the low resolution 'chunky' graphics available in standard Commodore 64 BASIC. However, unless special ROM modules are installed, high resolution graphics, programmed in BASIC, can be dreadfully slow. Because of this, we advise you to employ machine code routines to supplement the deficiencies of BASIC. However, this series is supposed to be about BASIC so how can we bring in machine code without involving readers who do not feel justified in devoting the necessary study time to this admittedly more difficult subject? A reasonable compromise is to provide a BASIC program which calls on machine code subroutines for handling the tricky bits. The problem of entering the machine-code bytes is easily overcome by means of a separate program which loads the machine code hexadecimal bytes, (see Program 11.2).

Program 11.1 must be RUN before the main BASIC program can be used so we must deal with this first.

### Details of the hex loader

The object of the program is to read in the rather formidable block of hexadecimal data bytes, representing the machine code, and store them sequentially in memory, starting at the usual address \$C000 (the second line in the program assigns this address #1032 in decimal to the variable M). Now it is very unlikely, however skilled you are at the keyboard, that all these data bytes are going to be entered first time without error. The bytes are virtually meaningless and, because they do not correspond to any observable pattern, must be entered blindly and without intelligent aid. Because of the error prone nature we have used a useful trick known as a checksum which will automatically spot the slightest error made during data byte entry at the keyboard. Some readers may



be unfamiliar with the checksum technique so a few words of explanation are indicated. After the machine code bytes have been entered and proven during the development stages, they are added and the resultant figure preserved for subsequent use when the bytes are entered. In this case, the checksum of the bytes, rather surprisingly, happened to be a nice round figure of 4990. This value has been assigned to the variable CH in the second line of the program. When the program is RUN, the five bytes are added up and the final sum checked with CH (see line 100, it is a lot good!) Well, almost! It is possible, but extremely unlikely, that you make two or more keying errors which together produce a compensation error which just happens to equal the correct checksum. Because such a possibility is remote, you can safely bet that if you get the message 'CODE LOADED OK' all bytes are good. We would warn you however, that you should always SAVE a reserve copy of any program involving machine code, or RUN it before it is actually RUN. It is quite possible that, if you have made an error, the machine will crash causing loss of all bytes and you will have to start again from scratch - a dismal prospect even for the most philosophical of us.

Although we make no attempt here to explain how the machine code sections work, details are to be found in this month's ancient pumping article 'MAINTAINING MACHINE CODE'. Both these series are clearing towards their closing months so we thought it would be nice for the two parts to converge.

Finally, it must be emphasised once again that Program 11.1 must be entered and RUN before the BASIC program 11.2

### Details of the graph plotting program

Most people think mathematics, although some grudgingly admitted that mathematics can be useful at times, particularly in this modern age. Fortunately, the computer has made

many people aware of the importance of maths and, because it can take on much of the boring drudgery, more and more are showing signs of actually liking the subject. Apart from handling the arithmetic, the computer comes into its own when dealing with graphical output. An equation comes to life when it is presented in form of a graph, showing how one quantity varies in response to changes in another. Program 11.2 does just that.

### Program details

As its name implies, the program accepts an equation, together with certain details, entered from the keyboard, and proceeds to plot the curve in high resolution form. The curve appears against a background of calibrated X and Y axes known as cartesian coordinates. For example, we can take a simple equation such as  $Y = X^2$ . The progressively increasing values of X are plotted on the horizontal axis and the X squared values on the vertical or Y axis. The range of X values will have to be stated by the operator by entering the lowest and highest values. Obviously, real equations will not necessarily be in terms of X and Y but this is of no importance - as far as this program is concerned, it is just a question of variable names.

The program distinguishes between two fundamental types of graph, continuous and discontinuous. Most curves are continuous, in the sense that the variables progress smoothly with no sudden breaks or violent lurches towards infinity or -infinity. All we need do is tell the computer the range of X values and it will then calculate all the corresponding Y values which, in most cases, would be well within the capability of the computer's numerical limit. Most equations likely to be encountered are like this but occasionally we come across an awkward specimen. To quote a few examples,  $Y = \sin X$ ,  $Y = \cos X$ ,  $Y = \ln X$  or  $Y = 1/X$  are three examples of well behaved continuous functions. On the other hand, the equations  $Y = \tan X$  or  $Y = 1/X$  are two



## Program 11.1

```

10 REM MACHINE CODE HEX LOADER
20 M=49152:CH=46000:S=0:PRINT CHR$(147)
30 PRINT"LOADING MACHINE CODE BYTES,PLEASE WAIT"
40 FOR P=0 TO 365:READ D#
50 FDX=ASC(D#)-48
60 SDX=ASC(RIGHT$(D#,1))-48
70 IF FDX>9 THEN FDX=FDX-7
80 IF SDX>9 THEN SDX=SDX-7
90 B7X=16*FDX+SDX
100 S=S+B7X
110 POKE M+P,B7X
120 NEXT
130 IF S<>CH THEN PRINT"ERROR,CHECKSUM"
140 IF S=CH THEN PRINT"CODE LOADED OK"
150 END
160 REM *
170 REM **
180 REM MACHINE CODE DATA
190 DATA 20,10,00,60,20,4E,00,60
200 DATA 20,D1,00,60,20,DC,00,60
210 DATA 78,AF,93,20,02,FF,AF,20
220 DATA 85,FF,AF,04,80,00,C2,20
230 DATA 90,00,20,AE,00,AD,0E,DC
240 DATA 29,FE,8D,0E,0C,AF,FE,8D
250 DATA 14,03,AF,00,8D,15,03,AD
260 DATA 1A,20,09,01,8D,1A,50,AE
270 DATA 02,8D,12,00,AD,11,00,29
280 DATA 7F,8D,11,50,58,60,AE,FB
290 DATA 29,07,AA,38,AF,00,85,5A
300 DATA 6A,CA,10,FC,8D,2F,AD,FB
310 DATA 29,FB,85,5C,AD,FD,4A,4A
320 DATA 4A,8D,58,4A,6A,5A,4A,4A
330 DATA 5A,6D,58,05,58,AD,FB,29
340 DATA 07,6D,5A,6D,5C,6D,5A,AD
350 DATA 58,6D,FC,6D,FF,8D,58,AD
360 DATA 00,81,5A,05,59,91,5A,6D
370 DATA AS,FF,8D,5D,AF,00,85,5C
380 DATA A2,1F,AF,00,91,5C,88,00
390 DATA FB,EA,5D,CA,00,F4,AD,3F
400 DATA 91,5C,88,10,FB,60,AF,00
410 DATA 8D,5C,AD,00,C2,8D,58,AD
420 DATA FE,A2,03,AD,00,91,5C,88
430 DATA D0,FB,6A,58,CA,00,F4,91
440 DATA 5C,AD,E7,91,5C,88,00,FB
450 DATA 60,20,4E,00,EA,FD,0E,01
460 DATA C2,00,F4,60,20,4E,00,EA
470 DATA FB,00,02,EA,FC,38,AD,01
480 DATA C2,E7,01,8D,01,C2,8D,03
490 DATA 0E,02,C2,AD,01,C2,00,84
500 DATA AD,02,C2,00,DF,60,AD,1F
510 DATA D0,29,01,F0,3A,8D,1F,00
520 DATA AD,12,8D,C9,10,90,17,AD
530 DATA 18,8D,2F,F7,8D,18,00,AD
540 DATA 11,00,29,0F,8D,11,00,AF
550 DATA 00,8D,12,00,F0,15,AD,18
560 DATA D0,0F,00,8D,18,00,AD,11
570 DATA D0,09,20,8D,11,80,AS,02
580 DATA 8D,12,00,20,9F,FB,20,84
590 DATA FF,C9,00,F0,23,78,AF,31
600 DATA 8D,14,03,AF,EA,8D,15,03
610 DATA AD,0E,0C,09,01,8D,0E,0C
620 DATA AD,1A,00,2F,FE,8D,1A,00
630 DATA AF,93,20,02,FF,58,00,AF
640 DATA 68,AD,68,AA,68,40

```

examples of discontinuous curves and will need to infinity at certain points. New computers, as you probably know, are just as wary of infinity to mathematicians are. There is an upper and lower finite limit to the magnitude of a number that a computer can handle without spitting out an error message of some kind. This means that a function plotter must first ask the operator whether the function is continuous or discontinuous. If the operator tells the computer it is continuous, then the Y axis is scaled automatically and it is only necessary to enter the range of X values over which the equation is to be plotted. On the other hand, if the function is discontinuous, then it will be necessary for the operator to give the Y value range as well as the X value range.

The plotting density, which is another way of stating the resolution, can be defined by the operator on a scale of 1 to 4. Plotting density 1 gives the lowest

resolution (small number of plotting points) and plotting density 4 the highest plotting density and therefore the closest in resolution.

There are no error trapping facilities in BASIC so be prepared for the program to break out if incorrect equations are entered. It is also possible for a break out to occur if the calculations attempt division by zero. If this happens, try the program again with different limits of X or perhaps with a different plotting density. This may avoid the region where the division by zero is occurring.

### Using the program

To obtain initial familiarity with the program, an example equation is already programmed into line 1080. So, in the first instance, the procedure is:

1. Enter RUN and press RETURN. After some explanatory messages, the program comes to a halt.

2. Enter STOP and press RETURN. You will then be asked to supply the following information:

"ENTER X AXIS (MIN)". Try 0.

"ENTER X AXIS (MAX)". Try 5.28 (which is approximately 1 times pi) since this will produce a graph of a sine wave nearly one complete cycle.

"ENTER PLOTTING DENSITY (1-4)". Suggest you reply with 1, the lowest density but fast to execute.

"AUTO Y AXIS LIMITING (Y/N)". This is really asking if the curve is continuous and therefore suitable for automatic scaling of the Y axis. The built in equation is indeed continuous because it is the sin X function and so you will enter Y.

- Assuming everything is OK with your program and the machine code bytes (mentioned earlier) are already resident in RAM, the program should begin to draw the typical sinusoidal graph of the function extending over one cycle.

# Program 11.2

```

10 REM HI-RESOLUTION FUNCTION PLOTTER
20 REM (USING MACHINE CODE SUBROUTINES)
30 PRINT CHR$(147);PRINT TAB(14);"GRAPH PLOT";PRINT;PRINT
40 PRINT"PROVISION OF Y AXIS LIMITS ARE NEEDED"
50 PRINT"FOR NON CONTINUOUS GRAPHS ONLY"
60 PRINT;PRINT"ENTER FUNCTION IN LINE 1000 SUCH AS";PRINT
80 PRINT"1000 DEF FN EQ(X)=SIN(X)";PRINT
100 PRINT"ENTER FUNCTION THEN TYPE 'RUN1000'"
110 END
997 REM *
998 REM **
999 REM START OF PROGRAM PROPER
1000 DEF FN EQ(X)=SIN(X)
1005 DIM Y(322);N=319;H=159;PRINT CHR$(147)
1010 DEF FN HI(X)=INT(X/256)
1020 DEF FN LO(X)=X-(FN HI(X)*256)
1022 DEF FN XC(X)=INT((N*(X-EL)/(XR-EL))
1024 DEF FN YC(Y)=INT((H*(YT-Y)/(YT-YB))
1030 INPUT"ENTER X AXIS (MIN)";XL
1040 INPUT"ENTER X AXIS (MAX)";XR
1050 IF XL>XR OR XL>0 OR XR<0 THEN PRINT"INPUT REJECTED";GOTO 1030
1060 INPUT"ENTER PLOTTING DENSITY (1-4)";AL
1070 IF AL<1 OR AL>4 THEN 1060
1080 AX=AL*80;INC=(XR-XL)/AX
1090 YT=0;YB=0
1100 INPUT"AUTO Y AXIS LIMITING (Y/N)";KB
1120 IF KB="Y" THEN 1150
1130 IF KB="N" THEN 1150
1140 GOTO 1100
1150 INPUT"ENTER Y AXIS (MIN)";YB
1160 INPUT"ENTER Y AXIS (MAX)";YT
1170 IF YB>YT OR YB>0 OR YT<0 THEN PRINT"INPUT REJECTED";GOTO 1150
1180 GOSUB6000
1190 POKE254,7;POKE2,216;SYB49152;REM INIT
1200 GOSUB7000
1210 GOSUB10000
1220 FOR N=1 TO 21:PRINT;NEXT
1230 PRINT"LARGE X AXIS DIVISIONS=";XX
1240 PRINT"LARGE Y AXIS DIVISIONS=";YY;
1250 GOSUB7000
1260 END
3997 REM *
3998 REM **
3999 REM CALL VLIN ROUTINE
4000 IF XX<0 OR XX>N OR YY<0 OR YY>H THEN 4060
4010 POKE251,FN LO(X)
4020 POKE252,FN HI(X)
4030 POKE253,YY
4040 POKE49665,LX
4050 SYB49160
4060 RETURN
4997 REM *
4998 REM **
4999 REM CALL HLIN ROUTINE
5000 IF XX<0 OR XX>N OR YY<0 OR YY>H THEN 5070

```



## Program 11.2 (cont)

```

5010 POKES251,FM LD(X)
5020 POKES252,FM HT(X)
5030 POKES253,Y
5040 POKES49665,FM LD(LX)
5050 POKES49666,FM HI(LX)
5060 SYS497164
5070 RETURN
5997 REM =
5998 REM ==
5999 REM CALL PLOTBIT ROUTINE
6000 IF X<0 OR X>M OR Y<0 OR Y>H THEN 6050
6010 POKES251,FM LD(X)
6020 POKES252,FM HI(X)
6030 POKES253,Y
6040 SYS497166
6050 RETURN
6997 REM =
6998 REM ==
6999 REM PLOT GRAPH SUBROUTINE
7000 N=0
7010 FOR X=XL TO XR+INC/10 STEP INC
7020 N=N+1
7030 X=FM XC(X)
7040 Y=FM YC(Y(N))
7050 GOSUB4000
7060 NEXT
7070 RETURN
7997 REM =
7998 REM ==
7999 REM TABULATION SUBROUTINE
8000 PRINT CHR$(147);PRINT"TABULATING"
8010 N=0;FOR X=XL TO XR STEP INC,N=N+1
8020 Y(N)=FM EQ(X)
8030 IF K8="M" THEN 8060
8040 IF Y<Y(N) THEN Y=Y(N)
8050 IF Y>Y(N) THEN Y=Y(N)
8060 NEXT
8070 RETURN
8997 REM =
8998 REM ==
8999 REM DRAW AXIS SUBROUTINE
9000 X=FM XC(0)
9010 YZ=0;LX=M+1;GOSUB4000
9020 YZ=FM YC(0)
9030 XZ=0;LX=M+1;GOSUB5000
9040 RETURN
9997 REM =
9998 REM ==
9999 REM DRAW AXIS DIVISIONS SUBROUTINE
10000 K=XR;IF ABS(XL) > ABS(XR) THEN K=XL
10010 GOSUB1000;X=K
10020 FOR X=P TO XR+R/10 STEP R
10030 XZ=FM XC(X);YZ=FM YC(0)
10040 LX=0;IF YZ=10 THEN YZ=X-XL=11
10045 IF YZ=M+10 THEN LX=LX/2

```

together with calibrated pipes on the X and Y axis. You can then try out the program again with perhaps different X limits and perhaps a higher plotting density. For example, try the effect of X (MAX) = 4.25 and X (MAX) = 12.5 and a plotting density of 4. This should show almost three complete cycles of a sine wave.

## Using your own equations

Once you have gained familiarity with the program you will naturally want to enter your own equations instead of sticking to the one built in. The instructions to do this are presented on the screen during the initial run but it is worth giving an example. Suppose you want to graph the equation,  $Y = (X + 4)^2$ . The first you must enter, when the first part of the program has come to a halt, would be:

```
1800 DEF FN DQ (X)=X^2+4*X: 1
This, of course, will now replace the original line 1800. You must then enter RUN 1800 before the program will continue. The rest is up to you.
```

If the equation you want happens to be discontinuous, then your reply to the query "AUTO Y AXIS LIMITING (Y/N)" must be N. You will then be asked to enter your own Y limits instead of relying on automatic scaling. If you have no knowledge whatsoever of the behaviour of the function, then this will be very much a trial and error process which must continue until the Y limits are deemed acceptable.

Those who, in the past, have spent hours plotting equations on graph paper with paper and pencil (and rubber) will appreciate the value of this program. An equation like  $Y = \sin X + 3.67 \cos X - \sin X^2$  would be drawn in seconds by the computer. How long would it take you without one?

## How the program works

Drawing some sort of graph on the screen is relatively easy. The trouble arises when you have to tailor the graph to make full use of the available screen area and, more importantly, to avoid overstepping the boundaries. This means that all actual X values and corresponding Y values can not be used in their raw form. This means that:

- The maximum and minimum Y values must first be found.
- The calculations must then be scaled to fit into the screen area but without wasting any space.
- The scaled values must then be transformed into the appropriate screen coordinates.

As you will appreciate, the entire project is far from easy and so you will understand why the program may seem rather lengthy. Another complication is the production of calibration pipes on the

## Program 11.3 (cont)

```

10050 GOSUB4000:NEXT
10060 FOR X=P TO XR+10 STEP R/4
10070 XE=FN XC(X):YE=FN YC(Y)
10080 L3=3:IF Y3=10 THEN Y3=YE-3:L3=5
10090 IF Y3=H-10 THEN L3=L3/2
10090 GOSUB4000:NEXT
10110 K=YT:IF ABS(YB)=ABS(YT) THEN K=YB
10120 GOSUB11000:YY=K
10130 FOR Y=P TO YT+R/10 STEP R
10140 XE=FN XC(Y):YE=FN YC(Y)
10150 L3=5:IF X3=10 THEN X3=XE-5:L3=11
10160 IF X3=H-10 THEN L3=L3/2
10160 GOSUB4000:NEXT
10170 FOR Y=P TO YT+R/10 STEP R/4
10180 XE=FN XC(Y):YE=FN YC(Y)
10190 L3=3:IF X3=10 THEN X3=XE-3:L3=5
10195 IF X3=H-10 THEN L3=L3/2
10200 GOSUB4000:NEXT
10210 RETURN
10997 REM *
10998 REM **
10999 REM FIND GRADUATION INCREMENT
11000 E=0
11010 K=ABS(H)
11020 IF K<1 THEN K=K+10:E=E+1
11030 IF K<10 THEN K=K/10:E=E+1
11040 IF K<1 OR K<10 THEN 11020
11050 K=-INT(K+1)
11060 P=K*10^E
11070 R=1*10^E
11080 RETURN

```

screen. The program has been arranged so that the pip represent integral powers of ten. This should make it easy to read off the values. A test window, of about four lines, at the foot of the screen is employed to display the values of these zero graduation increments. Raster interrupt techniques are used to display and switch between the high resolution screen and the text screen.

The program has been written, as far as possible, in light, self contained, subroutines. The meat of the program begins at line 1000 with a batch of five user-defined functions followed by the set of keyboard prompt messages. This is all fairly straightforward coding for X and Y value limits, plotting devices etc.

### Calling the Machine Code INIT routines

Line 1100 calls an initiating machine code routine called INIT. This machine code subroutine sets up the raster interrupts, clears screen memory and the 8K bit map area. Two parameters need to

be passed before calling the INIT routine.

1. The two colours allowable in the standard high resolution mode need to be FORKed into location \$H (204 decimal). The upper nibble (4 bits or half a byte) is set to zero (black) and the lower nibble is set to F (yellow). Therefore FORKing 1 into location 204 specifies a black graph on a yellow background.

2. The position of the screen split between graphics and text needs to be FORKed into location \$Q (3). FORKing 20 into location 3 produces a test window of about four lines at the bottom of the screen.

### The subroutines

CALL VIEW ROUTINE (COSUB 4000)

Draws a vertical line of length, L%, starting at the screen coordinate specified by X% and Y%. The purpose of using the DIFFER function FN LQ(X%) and FN HQ (Y%) is to split the X screen coordinate X%, which may exceed 255, into two-byte form for direct FORKing into locations \$B (20) and \$C (22). The

length parameter, L%, must be FORKed into location \$C280 (49665).

L% should be within the range 1 to 255. Y% should be within the range 0 to 199. X% should be within the range 0 to 255. Once the parameters have been FORKed the machine code subroutine is called from BASIC with SYS 49660.

CALL RUN ROUTINE (COSUB 5000)

This sets up the parameters and calls machine code routine for drawing a horizontal line. Parameters are identical to above except of course that L% can be as large as 500. Therefore the functions FN LQ(X%) and FN HQ(Y%) are needed to FORK the necessary bytes into \$C000 (49660) and \$C201 (49661).

CALL PLOTNT ROUTINE (COSUB 4800)

Lights up a pixel at the prescribed screen coordinates by calling on a machine code subroutine from BASIC with SYS 49126. The parameters that need to be FORKed prior to calling are the X coordinate X% and the Y coordinate Y%. The X coordinate value must be split into low byte and high byte form as above. The Y coordinate value Y% is always less than 255 so can be FORKed directly. The machine code subroutine itself is called from BASIC with SYS 49116.

PLOT CLAMP (COSUB 1000)

Plots the actual graph with the aid of FN XC and FN YC. These scaling functions translate the actual values of X and Y to a scaled value within the available screen area. The subroutines frequently employ the CALL PLOTNT SUBROUTINE to light up individual pixels corresponding to the graph.

TABULATION (COSUB 8000)

This subroutine is responsible for finding the maximum and minimum values of the function and also calculating all Y values corresponding to the X values. The individual results are then held in the array Y (H), ready for use in plotting the graph. If the function, was deemed by the operator to be discontinuous, (answered YES to the query instead of Y) then lines 8000 and 8005 are not skipped.

DRAWN AXIS (COSUB 9000)

Draws the X and Y axis of the graph. DRAWN AXIS (COSUB 10000)

Draws and positions the calibration pip which are to appear on the axis. Each large graduation interval, corresponding to an integer power of ten, is further divided into 3 small graduations to give accurate readings of the graph.

FIND GRADUATION INCREMENT (COSUB 11000)

This subroutine calculates the range and integer powers of ten increment for the graduation pip positioning and is used in conjunction with the previous subroutine.

The full assembler listing and detailed descriptions of the various machine code routines are in the MAXIMISING MACHINE CODE article in this issue of YOUR COMMANDER.



**Romcasters discover that adventures don't really need text with two games that set new standards for adventure programs.**

SEVEN MONTHS BACK HE LOOKED AS if he had just completed an incredible athletic achievement. "Impossible Mission," fantastic graphics and as he has been proved by his sales, a winner all the way. In between, guiding the ball around the screen in all sorts of athletic manoeuvres, various operations are performed by moving a cursor over a selection of small pictures, or icons, to issue a command to the computer.

This use of icons is very much in vogue at the moment, with many business systems using this technique to go along with menu programs which are simple and logical to use. When often the ease of speed of use is sacrificed slightly, as it is often quicker to type **LOAD PROGRAM** than to manipulate a cursor over the appropriate icon and bring the screen around.

Nevertheless 'user driven' programs have much to offer, by making input commands limited to only those that may be understood and acted upon. They often employ good graphic effects, especially when full colour, hi-res pictures are used, such as in Beyond Software's 'Shogakukan'.

## Shardul Thakur

The instruction booklet insists that there are no side-effects to impede the fast flow of real time, high speed advantage. The screen presentation is in a word - excellent - as it is through the speed of operation is, in practice, perhaps not so fast as one has been led to expect; it is difficult to see how the independent handling of six different characters could be improved upon by any other system.

The basic scenario revolves around the kidnapping of one Ambassador Kiputi, who has a top secret micro-disk embedded in his spine (2). He must be rescued quickly and at any cost.

Super bubble General Kyli, holds Kyria captive aboard his personal "ship-tanker" behind an interorbital. Moreover, possibly penetrate with a heavily defended position and successfully complete the mission in such a short time.

Inter...Enigma, a receptive organisation with its operatives a classic mixture of whites, blacks, reds and dedicated 'super persons' together with barely controlled 'super criminals' and the latest in cybernetic technology.



You have worked hard almost, over this team of stalking death dealers. Now have one hour and forty minutes in which to locate and free the prisoner, capture General Solt and destroy his shipments. Use the time wisely, you will need every second.

Control may be either from the keyboard, analogue or digital joystick (the normal joystick is digital) or even by the use of a light-pen. Reading the operating manual is a must! You may not realise it all that it has to tell you at the

Likewise, each team member has specialized training in various areas. So before you start asking them for the missing mission... read the manual. Only one can carry and operate the portable transporter. Someone. Only one can successfully push the back to be found on the enemy's side.

You may only have orders to one person at a time (i.e. an android's person). On selecting the member to interact, the display graphically shows you that person's status - strength, agility, stamina and the weapons they are carrying.

The display also depicts graphically the present status of all the team members, whether they are inactive, starting, moving, detaching, weak, dying etc. A 'view screen' gives you a plan of the immediate area around the chosen character, including other team members and enemy units (if there is a combat).

Finally a box at the bottom right of the screen encloses the icons for further commands. You may choose the Object, Movement or Battle actions, or you may click loading commands on that screen.

Choose the Object screen and you will again be presented with a series of icons. Those in the box to the right allow you to manipulate the object's shape in the object tree boxes. Those to the left are what is visible at that location and therefore the camera are what that character is already carrying. The control icons permit picking up, dropping, attraction or reaching for an icon. Three others enable you to display the other control screens as they exist.

The Movement sensor displays eight arrows indicating the possible directions of movement, although not all eight directions may be permitted.

The Bunker screen allows the choice of attack, defend, retreat or just observe, in any of eight directions. Having made your choice, any characters visible in that direction are displayed in a box on the left.

doi:10.1017/S0022292412001619



First read but to start your mission come on all of your team have got to be transported over to General Jeff's skybox. Without reading the manual this may take you some time to complete.

takes a little concentration. Fortunately the learning period is short, partially due to the clear instructions and partially due to the simplistic icon control system.

### Moving around...

Again, read the manual! Android Manno is the only team member who can operate the transporter beams and the strong sequence of moves can leave Manno on the enemy coast without any means of returning, or of summoning any help!

When transporting and team members, make sure that they are adequately armed, you may well need some more weapons sooner than you expect. Also take note of the brief notes on your team's character profiles...there is more in them than first meets the eye.

Like any adventure game you cannot expect to solve this one at one sitting. You will need to map out the enemy ship if only to find out what are enemy capstans and what are important passages. Remember that some characters move faster than others and could well prove to be advisable assets.

Unlike most adventures there do not appear to be many objects to find and puzzle over...on the other hand not all objects found are described in the manual. Some are weapons, even if you don't know exactly what they do!

The frequency of meeting enemy troops also appears to be somewhat random, and one early game had me manoeuvring five characters around for over an hour with only two incidents and nothing of great interest to report.

Although the icon drive system works very well and new screen displays are shown only quickly for a few seconds, there is an appreciable delay whilst you are doing to DDD something. There are plenty of features to explore but really very little variety in the objects to be found.

There is a SAVE game facility, so before entering into what may be a fatal confrontation with the enemy - you can always 'hedge your bets'. Never forget that the ship runs away, tries to fight another day!

The puzzles are more of 'mapping' and 'route strategy'...if you like the 'homer like' scenario then 'Shadowline' is a must. Even if this is not your first choice in adventure games, it will surely be a classic of its type and I suspect will bring you back many times as you attempt to better your previous efforts...

It is also interesting to note that Beyond propose to offer a 'Shadowline' turn in the future. This will allow you to alter the Deigma team's strengths and weaknesses, to locate weapons and objects, map out the ship's route and more! Could this be because they think the game is too easy...or too hard.



Whether it is the answer, it can only add to the possibilities of a good game.

### Tir na Nog

Here we have another graphic arcade adventure, it has to have the word 'arcade' because a certain amount of dexterity is called for in controlling our hero Cuchulainn. It is more truly a pure graphics adventure.

Tir na Nog is the Land of Youth in Irish myth, the same world in which the inhabitants of the fairy mounds lived. Cuchulainn was a great hero of Ulster again in Irish legend, and the story of his prowess and daring are legend.

Carpenter Games have combined a number of tactical (well I believe to use memory anyway...) and tactical situations and places to produce quite a remarkable adventure. The aim being to guide Cuchulainn in finding the lost scattered parts of the Seal of Calann. The only answer to controlling or inhibiting the Great Enemy. The seal was shattered into eight, forcing the Enemy to pursue his evil ways.

The shade of the dead hero Cuchulainn, snakes and snakes across your screen in search of the four parts of the seal. The graphic representation of this hero is quite lovely! The hyper-charge-through-corrider display is quite an own's admiration for the programme.

The background scrolls smoothly past giving the sense of you to the idea of computer movies. Control is from the keyboard, and is not the easiest thing to come to grips with! You can in fact only direct him to move to the left or right, but, to continue the metaphor, you can use him from any of four directions! This means he can walk to the East by either moving to the left or the right - depending upon whether you are looking at him from the South or the North!



Initially this takes quite a bit of getting used to...

To make matters worse there are any number of little wandering around. Should you meet one of these creatures and not possess a weapon that can affect them, you are lost (and you cannot be killed...you are already dead to your starting place by the Altar of the Seal. If you are unable to control our hero with any certainty, then the more likely you are to lose any objects found to date and end up starting again!

The road to Tir na Nog is to spend time right at the beginning learning how to control his movements. Once you have some semblance of control, then you start begin to map Tir na Nog.

The little are presumably degenerate descendants of the Gods of the myths - the original inhabitants of the fairy mounds that abound in Tir na Nog. Even these and although time does not slow down as in the myths, you may well be in for a surprise when you take a different exit. Magical transportation is fairly common!

Although it is around for the taking and all appears to have some use...you just have to find what that use is! Also bear in mind that there are a number of invisible 'doorways', so if you seem to be in an impossible situation, keep moving in different directions...there is probably an exit you cannot see!

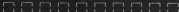
Each object that you pick up may be used as a weapon and you have the choice of those carried in to which to use. Again this means quite a long 'learning cycle' while you learn what is effective where. On the other hand there is a SAVE game facility...make use of it!

Definitely a game to investigate, with plenty of interest that maintains a Celtic mythos most convincingly. Even doing so many iterations but once you have got the hang of what is expected of you...quite addictive.

```

5 REM***ADVENTURE MAP GENERATOR***
6 REM***BY R.D. CLARKSON***
10 POKE 53280,0 : POKE 53281,0 : PRINT "C"
20 GOSUB 250
40 PRINT "SET UP PRINTER FIRST, THEN PRESS ANY KEYS TO PRINT A COPY"
50 POKE 198,0 : WAIT 198,1
60 GOSUB 250: PRINT "PLEASE WAIT....."
70 OPEN 4,4
80 PRINT#4, "ADVENTURE TITLE....."
90 PRINT#4
100 FOR NL = 1 TO 20
110 FOR TR = 1 TO 16
120 PRINT#4, " "
130 NEXT TR
140 FOR BR = 1 TO 16
150 PRINT#4, " "
160 NEXT BR
170 PRINT#4, : PRINT#4
180 NEXT NL
190 CLOSE 4
200 GOSUB 250: PRINT "ANOTHER COPY ? "
210 PRINT "PRESS Y OR N"
220 GET A$ : IF A$ = "Y" THEN 30
230 IF A$ = "N" THEN PRINT "C" : END
240 GOTO 220
250 PRINT "ADVENTURE MAP GENERATOR" : RETURN

```



## Mapping an adventure

### Adventure Map Generator Variables used -

- 11. loop for number of squares down
- 18. loop for top half of square
- 88. loop for bottom half of square

### User explanations:

- 10 sets Border, Background and Text colours
- 40 Prints warning on screen
- 50 waits for key press before printing
- 60 clears screen and sets user to wait
- 70 opens channel to printer
- 80 prints heading at top of page with space for name of adventure and date
- 90 prints blank line
- 100-180 starts loop for number of squares down
- loop for top half of square
- 120 prints top half of square (graphics are - shift 0 - Commodore shift Y - shift P - 2 space)
- 140-160 loop for bottom half of square
- 180 prints bottom half of square (graphics are - shift L - Commodore shift P - shift - 2 space)
- 170 prints 2 blank lines
- 190 sets loop for number of squares down
- 210 closes channel to printer
- 230 sets another copy Y, or ends
- 240
- 250 prints program ok

We have not published any program listings before in terms of Adventure but there is always room for something interesting at useful. Here is one such, an Adventure Map Generator by Malcolm Clarkston of Southgate.

I have mentioned many times, the necessity to map your travels within adventure games and have on several occasions drawn your attention to the excellent Adventure Planner pads produced by Peter 'n' Peter. Malcolm's program will enable those of you with a printer to create your own...

The program will work on a C128 or with an 800 or equivalent printer. As written it will print 100 squares on a sheet, in a 16 x 20 grid. The listing, variable list and line notes should be self explanatory. The squares are small and are intended for just a number, you will have to keep a separate record of what each number signifies.

The reduction of the number of lines (down the page) in line 180 together with the addition of a PRINT on even another FOR...NEXT loop printing two vertical lines at line 110, would lengthen the boxes and enable more to be written with them. As may the program works as is...experiment with it to suit your needs.

# RELIABLE ROUTINES

**Mike Hart rectifies some of the faults of Commodore Basic with handy REPEAT and DO loops.**

IT IS WELL-KNOWN BY NOW THAT THE version of BASIC contained in the C64 and the VIC is riddled to put it politely, deriving from the version of BASIC found in the PETs. The most obvious omissions are the absence of control loops such as DO...WHILE or REPEAT...UNTIL which are found in more recent (and better structured) BASICs such as version 7.0 in the C128.

However it is possible to simulate both of these structures by using CBM BASIC in particular ways. I shall present here two ways of adding REPEAT...UNTIL loops, the first being in BASIC itself whilst the second is a machine-code routine.

## REPEAT...UNTIL in BASIC

To implement REPEAT...UNTIL in BASIC we can utilise FOR...NEXT loops as our basic building block. In the traditional FOR...NEXT loop we are using the loop counter to specify the number of times that we wish to have an operation performed. The trick is to make the FOR...NEXT loop an endless loop (i.e. repeat itself) while a condition is untrue (i.e. logically false but have the loop end when the condition under test is true. In other words there are two processes involved here - let us consider both in turn.

Firstly, how do we make the loop endlessly repeat itself? The answer lies in knowing how the loop operates in the first place. The loop will always be performed at least once. When NEXT is encountered the step increment will be added to the loop variable. The new loop value is now checked against the specified upper limit and if it is less (or with a negative step greater) than the loop is deactivated. If we specify a STEP size of 0 then usually the upper limit will never be exceeded and the loop will repeat indefinitely. To check this out the reader can see that the following loop will never end until the RUN-STOP key is pressed: FOR I = 10 TO 1 STEP 1 : NEXT I

The next stage in the process is to use

logical operators to determine the truth of an expression. If an expression is "true" then a value of -1 will be produced. So in the expression:

```
A = 10 : B = (A = 9) : PRINT B
B will always take a value of 0. If we were to change the expression so that B = (A = 10) we now find that B is true and has a value of -1. To make our REPEAT...UNTIL loop all we have to do is make an endless loop which repeats indefinitely while the condition is false (i.e. 0 but which ends when the condition is true (i.e. -1).
```

We achieve this in the following way. I am assuming that we wish to double and

print out a number until such time as the number exceeds 1000.

```
10 A = 1
20 FOR I = 0 TO -1 STEP 1
30 A = 2 * A : PRINT A
40 I = (A > 1000) : NEXT I
While A is less than 1000 then I will be false (i.e. 0. When incremented by a STEP of 1 it remains 0. This is greater than -1 and so the loop continues. When A = 1024, it is "true" (i.e. > 1000 and so I is made to -1. This is incremented still by 1 but -1 is not greater than the end-limit and so the loop ends.
```

## Program Listing

```
B*
      FC  SR  AC  XR  YR  SP
./ 0000 30 4F 4F 00 F6
.
02A7 4C 3C 03      JHF #033C
02AA A2 02      LDH #002
02AC 80 A7 02      LDA #02A7,X
02AF 95 73      STA #73,X
02B1 CA      DEH
02B2 10 F6      BPL #02AC
02B4 00 02      STX #02
02B6 88      RTS
02B7 A2 02      LDH #002
02B9 80 A2 E3      LDA #E3A2,X
02BC 95 73      STA #73,X
02BE CA      DEH
02BF 10 F6      BPL #02B3
02C1 88      RTS
02C2 C0 7A      INC #7A
02C4 00 02      BNE #02C8
02C6 C0 7B      INC #7B
02C8 A0 00      LDY #00
02CA 01 7A      LDA (#7A),Y
02CC 88      RTS
```



## Program Listing

```

B*
PC BR AC HR YR SP
.10000 00 4F 4F 00 00
;
030C 00 C0 00 JBR 000C0
030F 00 00 CHF 0000
0311 00 00 BEQ 00040
0313 4C 70 00 JFF 00070
0315 00 C0 00 JBR 000C0
0318 00 00 CHF 0000
031B 00 00 BEQ 00070
031D 00 00 CHF 0000
031F 00 F0 00 BNE 00040
0321 00 00 INC 000
0323 A0 00 LDA 000
0325 0A 00 ABL
0326 0A 00 ABL
0327 AA 00 TAX
0328 A0 70 LDA 070
032A 00 C0 00 STA 000C0,H
032D A0 70 LDA 070
032F 00 C0 00 STA 000C0,H
0332 A0 0A LDA 00A
0334 00 CF 00 STA 000CF,H
0337 A0 30 LDA 030
0339 00 C0 00 STA 000C0,H
033C 00 C0 00 JBR 000C0
033F 4C AE A7 JFF 007AE
0370 00 C0 00 JBR 000C0
0375 00 C0 00 JBR 000C0
0378 00 00 00 JBR 00000
037B A0 01 LDA 001
037D 00 00 BEQ 00004
037F 00 00 DEC 000
0381 4C 40 A0 JMP 00040
0384 A0 00 LDA 000
0385 0A 00 ABL
0387 0A 00 ABL
0388 AA 00 TAX
0389 00 C0 00 LDA 000C0,H
038C 00 70 STA 070
038E 00 C0 00 LDA 000C0,H
0391 00 70 STA 070
0393 00 CF 00 LDA 000CF,H
0396 00 0A STA 00A
0398 00 C0 00 LDA 000C0,H
039B 00 00 PLA
039E 00 00 PLA
03A0 4C E4 A7 JMP 007E4

```

This is an example of a REPEAT...UNTIL loop but a DO...WHILE loop will test the condition before processing and skip the further processing if this proves not to be necessary. To turn the above into a DO...WHILE loop then make line 03A = 1001 and add a new line:

```
25 IF A>1000 THEN J = -1 : GOTO 00
```

As you can see, the processing section of the loop is completely missed out if initially A is set to a value greater than the upper limit.

## REPEAT...UNTIL in machine code

Also given is an implementation of REPEAT...UNTIL in machine-code in a form which works on both the VIC and the C-64. By sharing CHRGIT to look for the < character, the routine identifies when a R (for REPEAT) or a U (for UNTIL) are required, just a few points need to be made about this implementation. Firstly, it is now the programmer's responsibility to make sure that the looping variable is correctly initialised - see line 100. Secondly, notice that nested REPEAT...UNTIL are possible - in fact a secondary stack is created to allow for nesting up to 10 deep.

## Re location

To minimise relocation difficulties, the routine is split into two halves, the first half of which occupies 000A7-000CC where it should be sited! The second half of the routine can go anywhere that is protected although I have put it in the cassette buffer. The second half of the routine makes calls into the first half of the routine both to initialise and reset the CHRGIT routine (which looks for and processes BASIC characters one at a time) and also builds up a stack of line addresses and pointers. This is to ensure that when a <U is met the interpreter 'knows' where to return to and keeps the line numbers correct. Locations 000 and 001 should contain the low and high bytes of the start location of the main routine, if C64 owners wished to put the main routine into 00000 then they could make 0 in line 14 equal to 4000 and lines 30-31 would ensure that the correct low and high bytes were pushed into position.

Finally, for VIC owners a list of changes is given to enable them to run the routine on their own machines. It has been tested out on both!

## Changes for VIC owners

| Line | Byte | From  | To    |
|------|------|-------|-------|
| 52   | 4    | 182   | 135   |
| 54   | 7    | 4681  | 4634  |
| 61   | 6    | 187   | 190   |
| 62   | 7    | 173   | 205   |
| 53   | 8    | 188   | 204   |
| 67   | 6    | 187   | 190   |
| 67   | 7    | 11580 | 11620 |

## Program Listing (cont.)

```

1 REM *** REPEAT-UNTIL ***
2 REM      C-84
3 "
4 REM *** M. C. HART ***
5 "
6 REM SYNTAX: AR(EMP),...,AR(EMP)
7 REM INITIALISE WITH ...SYS 000
8 REM RESTORE WITH ...SYS 000
9 "
10 THEFOR J=070 TO 010:READ KIT+TH
11 FOR J,K:IN:TH:READ CH
12 IF CH<17 THEN PRINT "DATA ERROR!">END
13 "
14 S=000: REM LOC'N OF MAIN CODE
15 "
16 THEFOR J=0 TO 010:READ KIT+TH
17 FOR J,K:IN:TH:READ CH
18 IF CH<17 THEN PRINT "DATA ERROR!">END
19 "
20 FOR I=001,0,000:REM LOC'N HIGH
21 FOR:000,0,000:001:000:REM LOC'N LOW
22 PRINT-PRINT:CODE ENTERED S=I,"
23 PRINT-PRINT:RUN 000 FOR S=0>END>END
24 "
25 DATA 70,00,0,100,0,100,107,0
26 DATA 140,110,000,10,040,104,0,00
27 DATA 100,0,100,100,107,140,110,000
28 DATA 10,040,00,000,100,000,0,000
29 DATA 100,100,0,177,100,00,0001
30 DATA 00,104,0,001,00,040,0,70
31 DATA 01,0,00,104,0,001,00,040
32 DATA 07,001,00,000,040,000,0,100
33 DATA 0,10,10,170,100,100,107,000
34 DATA 0,100,100,107,000,0,100,00
35 DATA 107,007,0,100,07,107,000,0
36 DATA 00,104,0,70,174,107,00,104
37 DATA 0,10,104,0,00,100,170,100
38 DATA 07,040,0,100,0,70,04,000
39 DATA 100,0,10,10,170,100,000,0
40 DATA 100,100,100,000,0,100,100
41 DATA 007,0,100,00,000,000,0,100
42 DATA 07,104,104,70,000,107,10000
43 "
44 REM *** GEND REPEAT-UNTIL ***
45 "
46 SYS 000: REM INITIALISE
47 "
48 S=0:J=1:PRINT "OUTER" :>REM OL
49 "
50 J=0: REM NO ZERO BEFORE INNER LOL
51 "
52 " S=J+1:PRINT J, "INNER
53 " S=J+1:PRINT-REM "INNER
54 "
55 S=0:J=0:REM OUTER
56 "
57 SYS 000:REM RESTORE CORRET
58 PRINT--END-->END

```





## Norman Doyle clocks on to

## Sello's RC-1000 wrist

## terminal.

THE MINK RC-1000, RETAILING AT around \$175, comes complete with application software on disk, on cassette and a clip-on connector which fits neatly onto two of the pins on the edge of the user port. It measures 41.8 x 10.6 mm, weighs 80 grams and has room for twelve characters on each of the two rows on its LCD display. Internal memory consists of 32 KCH and 32 KRAM.

This new device converts the usual wrist- borne technology into a state-of-the-art device which transcends the mere timepiece of the past and hints at what the future has in store for the busy jet-setting executive. It is not merely able to display the time and date but also has a daily alarm function and can remind you of birthdays, anniversaries and special appointments. It can display the current time in named cities, towns or villages worldwide, converted according to time-zone, act as a memory aid, a daily routine reminder, and store telephone numbers. The applications are limited only by its 32 KRAM memory.

What's all this got to do with Your Commodore? Well, all this information has to be fed into the watch and what better way than via the pseudo RS232C user port on the back of the Commodore 64?

The 64 software supplied with the database watch is written in BASIC allowing the knowledgeable user to modify the routines. But if anyone can come up with a more user-friendly version I'm sure it would make the watch a more attractive proposition - more of that later.

Using the program, data can be entered under one of four categories: weekly data, schedule alarm, world time and memo. Time details for the alarm occupy the lower twelve character line of the 24-character display leaving the upper line for text to remind you of the purpose for the alarm, such as 'ME DENTIST' or 'NOBODY'S BIRTHDAY'. They can be used to remind you of appointments either on a daily routine basis or for any specific time on a future date.

World times may be selected from any of the 98 cities stored by the program, but new data can be added if the place you require does not appear on the list, either by permanently changing the DATA statements in the program or by a temporary software-controlled addition.

The most flexible function of the unit is the memo facility. These entries may be further sub-divided into categories which suit your personal needs. Each entry can cover the two lines of the display or even overflow onto more lines if necessary.



# WATCH OUT!

This means that telephone numbers can be stored with a name label to remind you whose number it is, or even with notes for an exam, though only very brief notes could be made to avoid arousing the instructor's suspicion by constant key pressing!

The length of each main data category is selected by the user, so the database could consist solely of memos or schedule alarms. The only limit on its use is that a maximum of 80 entries of 24 characters each can be entered into the memory.

I was bitterly disappointed with the quality of the software. Consider for a moment the main market for this kind of equipment, the busy executive. The chances are that the programming of the watch would be delegated to a personal assistant or secretary, whose life is probably complicated enough without having to grapple with the complexities of the software provided. User-friendliness implies that the user can simply load and

run the program. I tried this with the Sello package and failed miserably, despite the two help screens and memos.

I also had to study the manual carefully to understand the program fully. Data entry was laborious and I was disappointed by the length of time it took to save the data to disk; I shudder to think how long it would take to save to tape.

Another drawback of the system is the fact that reprogramming requires hooking up to a computer so the executive will still have to carry a notebook to write down appointments which can later be entered into the watch's memory. A case of hi-tech for hi-tech's sake.

Casio have also produced a similar watch into which data can be stored simply by writing with your finger on the semitransparent display cover. Now, if someone could find a way to store that data into a computer database that would be a force to be reckoned with.



**How often have you wished  
that your 64 could help you  
to sort out your address  
book. Well now it can with  
this program from J.A. Wolfe.**

# SYSTEM 64

'SYSTEM 64' IS A COMPLETE ADDRESS handling program for the Commodore-64 computer. It allows you to store addresses as records in a file as well as bring the file to the screen, deleting records, printing records and recalling them from tape when required.

The program has been written to accommodate 256 names in each file, each which contain 6 fields or address lines and each line is capable of holding 30 characters.

The program is menu driven and the menu can be accessed at any time by using the left arrow key which has been assigned as the escape key.

The Add records section searches through the file for the first empty record and then offers the fields to be filled. As with the rest of the program this section uses a Machine code routine to compensate for the rather clumsy INPUT command offered by BASIC V2. The keys valid during the routine are held in the variable K01 and all other keys including RUN STOP are ignored. Any fields not required may be left empty simply by pressing RETURN.

The Delete records section requests the number of the record that is to be removed from the file and on a valid response will display the first line (theoretically the address) of that record before asking for confirmation of deletion. On escaping from this routine the file is collapsed to fill any holes created when deleting records. The reason for this is to compact the file so that time is saved during saving and loading operations; as only full records are stored to tape. This 'shuffle routine' is the only

other part of the program which could be better if written in Machine code as, depending on the amount of records deleted, it can take 45 seconds or more to execute, although it does take minutes in the parts of the program forementioned.

The List file section will display the first line of each record (20 records at a time) on the screen, any empty records are shown as asteris.

The Print records part of the program requests the numbers of the first and last records to be printed and allows you to reference the screen listing of the file; if the last parameter overlaps into empty records these will be ignored. The screen will then display a diagram to illustrate how the printer should be set up. Should you have trouble with paper feed or carriage adjustment during printing, a pause feature is included which then gives the option of continuing or abandoning the print.

Tractorised labels are cheap if you buy in fairly large amounts, although you can always use ordinary printed paper and cut it into labels as required.

As a final note on the print routine, it has been written for the Commodore 64PS 681 although it should run on other printers with little or no alteration.

The Save file and Load file sections are

fairly straightforward, I would recommend that files are saved on to a separate tape from that containing the program and that backups copies are saved regularly. As an assistance, I have included a status check after saving any file and if this produces an error, the program will return to the Save file screen.

Text is positioned on the screen by using the TAB statement and a string variable C05 which holds 24 cursor down characters compensating for the missing PRINT AT command and avoiding the use of cumbersome cursor control characters in PRINT statements. The same applies to the text colour which whenever possible is assigned to the variable T1 although in some places using the colour control characters has proved easier than continually opening and closing PRINT statements.

The variable F5 in line 70 which holds the file size may be increased without altering any other part of the program, however the following should be considered when using the DIM 3 bytes are used for the array name, 2 bytes are used for each dimension, 3 bytes are used for string variables, 1 byte is used for each character in each string element.

## Variables used by 'SYSTEM 64'

|      |   |     |  |
|------|---|-----|--|
| K01F | — Characters valid during input.            | L15 | — Used for underlining.                          |
| B0   | — Border colour.                            | L1  | — (1-4) fields containing address lines.         |
| B4   | — Background colour.                        | DAT | — Data 1.  |
| T1   | — Text colour.                              | L   | — Used for general loops.                        |
| NAC  | — Start address for Machine code.           | I   | — Used for loops when L is busy.                 |
| NC   | — Used to blank the screen.                 | INS | — Current character from keyboard.               |
| F5   | — File size.                                | PR  | — Contains PAGE value used by the input routine. |
| R3   | — Code for return key.                      | CC  | — Holds number of LISTS for C05.                 |
| R5   | — Code for delete key.                      | E   | — Input length.                                  |
| SF   | — Code for space bar.                       | E   | — Replaces KYS to K01F.                          |
| DF   | — Code for left arrow key (used as escape). | LN  | — Field (line) number.                           |
| CL   | — Code for ok key.                          | BS  | — Accumulates INS.                               |
| KYS  | — (1-5) strings used for KYS                | RS  | — Removes the 'real' input from INS.             |
| C05  | — Contains 24 cursor down characters.       | PF  | — First record to print.                         |
|      |   | LP  | — Last record to print.                          |
|      |   | V   | — Used to hold VAI of a string.                  |
|      |   | ST  | — File status (system variable).                 |



[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

# TOP 20 Gallup Software

Compiled by

## COMMODORE 64

### TITLE

- 1 Soft Aid
- 2 International Basket Ball
- 3 Dambuster
- 4 Pitstop II
- 5 Cauldron
- 6 World Series Baseball
- 7 Entombed
- 8 Impossible Mission
- 9 Theatre Europe
- 10 Alswell
- 11 Everyone's a Wally
- 12 Shadowline
- 13 Pole Position
- 14 Moon Cresta
- 15 Bruce Lee
- 16 Big Mac
- 17 Kikstart
- 18 Rocket Ball
- 19 Splitline 40
- 20 Raid Over Moscow

### PUBLISHER

- Various  
Commodore  
US Gold  
CBS  
Palace Software  
Imagine  
Ultimate  
CBS  
PFS  
Elite  
Mikrogen  
Beyond  
Atari  
Incentive  
US Gold  
Mastertronic  
B&B  
Microsoft  
US Gold

Retail sales for the week ending May 27th 1985



## VIC 20 Top Ten

### TITLE

- 1 BIP The Game
- 2 Hunchback
- 3 Beckman
- 4 Mickey the Bricky
- 5 Doodlabug
- 6 Psycho Shopper
- 7 Catcha Smicha
- 8 Football Manager
- 9 Vegas Jackpot
- 10 Bewitched

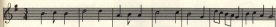
### PUBLISHER

- Mastertronic  
Ocean  
Mastertronic  
Firebird  
Mastertronic  
Mastertronic  
Imagine  
Addictive Games  
Mastertronic  
Imagine

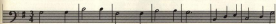
Retail sales for the month ended May 27th 1985

Compiled by Gallup for the industry's weekly trade magazine, Computer and Software Retailing. For details contact John Ross, Computer and Software Retailing, 222 Regent Street, London W1R 3AB. 01-434 2121.





# THE WELL-TEMPERED 64



**Phil South closes his music series with a few bells & whistles.**

## The Last Chorus

WELL HERE WE ARE, THE LAST EPISODE of this stimulating survey of simplified synthesis on the sixty-four! We've been through almost everything, all that remains is to tie up some loose ends and go out with a bang! (Cut the verbs! and get on with it, South! -- B.S.) OK! OK!, by the way, sorry if this all seems a little muddled; trying to explain about computer music in a four part series is like wrestling with a hot-battered octopus.

## Is it real, or is it...synthesised?

Last month we promised you some tips on Initiative Synthesis. Well, unfortunately we ran out of space, so to begin this last series into music and synthesis, here is the info.

Initiative synthesis is the art (or in some cases science) of imitating natural sounds or conventional instruments. This is a controversial topic, as synths can imitate ANY instrument, with intelligent programming, and you're telling that to the Musicians' Union; they'd smash your face in! Synthesists, and Computer keyboarders generally, are seen to be doing for the number of working musicians what the advent of computers did to the number of working accountants. Personally I don't think musicians have anything to worry about; NOTHING sounds as good as a real instrument played well by a real person. But I digress.

Here, for your use, are some hints and tips on how to imitate all your favourite instruments.

**PIANO:** The most difficult sound to imitate, mainly because of the complexity of the instrument; all that vibrating wood and metal! Still, try a pulse wave with an attack/decay of about 8, and sustain/release of 8. PORE the lo-bee pulse width address with 255.

Alternatively, use a triangle wave with fast attack, slow decay, no sustain, and a little release.

**MARACAS/HARD:** Mix one (flat) Almost the same as piano, but slightly less decay and release, to give it that sharp, plucky sound. Use a sawtooth wave, tool 100000. Octave range between 4 and 5, halfbeats wave with slow attack, slow decay and lots of sustain. Lots of glide and vibrato effects, too!

**SAW:** Tricky! Tension is in the octave range 2 to 4. Also in the range 3 to 5. Try a pulse wave and trim the width to taste. Modulate to fast attack, medium decay, lots of sustain and medium release. Use glide to slide UP to the notes.

**TRIANGLE:** Triangle wave, with a fast attack and slow decay/release. No sustain. Octave 4 to 7.

**TRUMPET:** Fast attack and no decay. Sawtooth wave in the octave 4 to 5. Trilling and vibrato goes well here.

**NOISE DRUM:** Noise wave. Fast attack, medium decay. Use drum rolls.

**NOISE DRUM:** Pulse wave on a very low octave. Same ADNR as Snare.

So there you have it: just a random sampling to give you a head start. If these sounds don't seem quite right to you, then fiddle with them. No, hold on there, I don't mean get per below it, I mean the start tinkering or feeling out the sound. The only way you can really learn to do this is if you can get immediate feedback as you alter the sound. You need a good synth package. This brings me neatly round to talk about the amazing MusiCalc.

## The Business

There is no two ways about it, I've seen pretty much every synth package for the 64 that there is, but this beats them ALL! Hands down. No messing about.

MusiCalc is a system, not just a program, but a suite of programs. They are being constantly updated and enhanced by the US writers, Waveforms, and their UK distributor, [01-241-3448].

The basic system is the MusiCalc 1 disk. This is the original program, and contains the synthesiser and sequencer parts of the system. The program presents you with

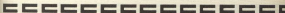
control panel, much the same as you would find on a real synth (What am I saying, this is a real synth!), unlike such a lot of other synth programs, which use two or three separate screens and confusing abstractions for different functions. MusiCalc crams all the information onto one screen by careful use of graphics (see screen shot): the title dashes under the names tabs and get on switches, and the black lines are faders. The grid is your sequencer display, showing a measure of sixteen beats, is fifteen rows.

The top row of faders control the ADNR, or attack, decay, sustain, release, for the oscillators, and are colour coded to the cursors on the sequencer grid. The next row shows control the pulse width. The row below that holds the faders for the filter and modulation. Finally, the bottom row displays the coarse, medium and fine tempo controls, giving the user a very wide range of tempos to select from.

The score, the manner in which notes are input into the sequencer, is a little strange to use at first, but you soon get used to it. It is actually quite logical, and the tutorial program soon has you tapping away with gay abandon. The lay of the land, with respect to storing each note, is competently illustrated by the sample tones, which when you hit beat up the disk are automatically loaded into the preset 501000 and 500001 locations.

MusiCalc 2, "Scorewriter" is the second disk in the system. On it are three programs which extend the already formidable facilities of the system: the Scorewriter program itself, the Mixer and E. Sequencer.

Scorewriter takes your SCORE files created by MusiCalc 1, and turns them into music sheets; music that can be read by any competent musician. This is great, because if you, like me have no idea about "tricks and blobs" notation, then this means that you really don't have to; the program does it all for you. The Mixer and E. Sequencer form a major improvement in the way MusiCalc plays back its SCORES, by allowing you to chain them together to make long and complicated tunes, otherwise impossible in the 1500 matrix.





**With Pact International Ltd's Panda cassette interface, it is now possible to use a normal domestic cassette recorder with the 64 or VIC 20. Does this mean death to the datasette? Mike Roberts passes judgement.**

# BEAR FACED

EVERYBODY EVEN SLIGHTLY INVOLVED with Commodore computers knows about the famous (or infamous) Commodore tape system.

Back in the old days, the Commodore PET (or around 1980) was the ultimate in home computers. It had a built-in screen and a built-in tape deck. At that stage nobody was arguing about the tape system because interfacing normal tape recorders was a pretty bit of miso affair.

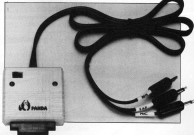
Later, PETs came with an external tape deck because the space on the front panel was needed to fit in a real keyboard. Some grumbles were heard from the computer fraternity at this stage, but nobody raised any serious objections due to maintaining compatibility with earlier models.

Then came the VIC and the Commodore 64. Commodore were universally slammed for their unwillingness to provide a 'normal' tape system using a domestic tape recorder. But there are some good reasons for having a dedicated unit. If, unfortunately, it's the most reliable and user friendly (who will ever forget **PRINTER ON TAPE**?) system ever devised, it compares favourably with other dedicated tape systems. Atari is unreliable and unfriendly, so is the Amstrad system - but just isn't really a dedicated system at all but just a standard Amstrad device plugged in for marketing's sake.

The big problem is price, whereas most people have a cassette recorder nowadays, most don't have the £45 necessary to buy a C24 or T850.

Looking at the output of the tape connector it doesn't seem too difficult to plug in a normal cassette as long as you connect it correctly. Alas, this is not so. Speech, music, and normal computer tape interfaces have their sound waves composed of sine waves or the like - great for music and speech, but not so good for transmitting computer information, which is, after all, a series of ones and zeros and not analogue at all.

The Commodore tape interface uses a series of square waves to transmit its information (much more suitable for computer data); this results in a square



wave. Domestic cassette recorders have square waves, some even have circuitry to turn them into sine waves, not what we want at all.

## Cassette interface

This brings us to the problem again of a cheap system for Commodore users. What we want is a cheap black box that plugs into the 64 or VIC and lets you use a domestic cassette recorder.

The 'Panda' cassette interface claims to solve the problem. Pack in utilitarian bubble packaging, it is neither cheap or black, but the 'blurb' does say that it will load all tapes 'including turbo'. Turbos are another problem for Commodore users as some normal Commodore tape decks will not even accept them, the frequencies are just too high.

The Panda interface is equipped with a special switch which is designed to alter the signal level and increase reliability. There are also two lights on top which indicate whether a LOAD or a SAVE is in operation. On opposite sides of the main box is the edge connector and the three

wires that go to your standard tape deck.

Unfortunately, I cannot give a favourable report for this unit as it does not function as is claimed. It will load normal 64 tapes, and it is slightly more reliable with tapes that have been written by it than with tapes written by a normal Commodore tape system. With Turbos though it was another story altogether. I tried in different tape decks, two interfaces and two Commodore 64s as well as one CBM 3012. The only turbs that would load in Novasoft, which was major for the reliability of the Turbo than for the interface because Novasoft is notoriously reliable, and will load into almost everything.

My verdict is that at £79.95 this device is far too expensive a gamble to take. You have to gamble that your tape deck will work with it, your computer will work with it, and that every piece of software that you ever buy with it will work - which is very unlikely, and sometimes most shops will refuse to swap software if it will work on their system. Surely £45 for a datasette isn't too much for peace of mind?

Hampton Court was never as dangerous as this program from Paul Randall for the unexpanded VIC 20.

# DEATH MAZE

DRIVE YOUR CRAFT AROUND A computer-generated MAZE while collecting as many of the flags as possible. Be extremely careful, however, as the slightest knock will relieve you of one of your five lives.

Your craft can be controlled by either joystick or keyboard. It rotates you right, it rotates left and the space bar starts your craft.

## Entering the Program

Death Maze must be typed into your VIC 20 in three parts; this is due to the large amount of machine code and character data.

Four simple steps must be followed in entering the program that are as follows:

1. Enter Program 1 and save on tape
2. Enter the machine code loader and save on a separate tape
3. Using the loader program type in the hex values exactly as printed. Each line

starts with a two digit number and ends with a checksum. Lines can be input in any order. If an error is made, the line will be displayed and can then be corrected using the cursor and INSERT/DEL keys.

Data can be saved to tape at any time by entering the word SAVE to the NEXT ONE prompt.

If you are only saving part of the data it is probably better to save it onto a spare tape. Remember not to load it back into the machine by typing LOAD when presented with the NEXT ONE prompt.

It is possible that if you have made any corrections to the data that line 98 will have been corrupted it is therefore advisable that you type this line in last.

When all of the data has been typed in SAVE it onto the tape straight after Program one using the SAVE option as before.

4. Enter the main program and save after the machine code and program one.

## Program descriptions

### Program one

|           |                                    |
|-----------|------------------------------------|
| 5-58      | Protects memory and loads in data  |
| 59-368    | Instructions                       |
| 1580-1558 | Machine code for joystick movement |
| 1680      | Loads in main program              |

### Program two

Machine code Hex values

### Program three

|         |  |
|---------|--|
| 4-40    | Set up variables (M is the number of craft.) |
| 51-55   | Sets up screen                               |
| 129-180 | Main movement routines                       |
| 200-270 | Craft routine                                |
| 330-348 | Game over routine                            |
| 360-368 | Finished level                               |
| 400-474 | Title screen                                 |
| 900-908 | Set screen                                   |

## Program Listing 1

```

5 POKE52,22:POKE56,22
10 POKE780,2:POKE781,1:POKE782,1:SYS65466
15 POKE788,8:SYS65469
18 PRINT"O      LOADING
20 POKE788,8:POKE781,18:POKE782,22:SYS65493
50 POKE36879,234:POKE36876,255
55 PRINT"JMS      DEATH HAZE
57 PRINT"8 SPORT OF THE FUTURE!"
59 PRINT"8      GUIDE YOUR CRAFT "
61 PRINT"8      AROUND EACH SECTOR"
63 PRINT"8      COLLECTING FLAGS"
65 PRINT"8AND AVOIDING BARRIERS,"
67 PRINT"PRESS FIRE OR SPACE TO  START. "
70 FORJ=1TO9
72 PRINT"#####"TAB(J+5)"#";
74 FORK=1TO100:HEXTK
75 ONJGOSUB300,301,302,303,304,305,306,307,308
76 POKE36878,J+5:POKE36876,255-J*10
78 NEXTJ:POKE36878,0
85 GETA#:(IFA#=""THEN85
90 PRINT"JMS      DEATH HAZE
95 PRINT"  THE CRAFT THRUSTS "
97 PRINT"8      FORWARD,"
100 PRINT"8 ROTATE RIGHT-HIT K"
102 PRINT"8 ROTATE LEFT-HIT J"
104 PRINT"8 OR USE A JOYSTICK"
106 FORJ=1TO9
108 PRINT"#####"TAB(J+5)"#";
110 FORK=1TO100:HEXTK
112 ONJGOSUB300,301,302,303,304,305,306,307,308
114 POKE36878,J+5:POKE36876,255-J*10
116 NEXTJ:POKE36878,0
118 GETA#:(IFA#=""THEN118
119 POKE36876,8
120 GOTO1500
300 PRINT"8H":RETURN
301 PRINT"8D":RETURN
302 PRINT"8T":RETURN
303 PRINT"8 ":RETURN
304 PRINT"8R":RETURN
305 PRINT"8-":RETURN
306 PRINT"8K":RETURN
307 PRINT"8E":RETURN
308 PRINT"8M":RETURN
1500 DATA120,169,0,141,20,3,169,###,141,21,3,89,96,169,0,141
1510 DATA19,145,141,34,145,173,17,145,41,31,74,74,133,144,173,17
1520 DATA145,41,32,74,5,144,133,144,173,32,145,41,128,74,74,74
1530 DATA74,5,144,73,31,133,144,169,255,141,34,145,76,191,234,234
1540 T=0:S=673
1548 FORI=9TO63
1545 READA:(IFA#=""# THENPOKE5+1,(S+13)/256:POKE5+1-5,(S+13)AND255:NEXT
1550 POKE1+8,VAL(A#):T=T+VAL(A#):NEXT
1600 POKE198,0:PRINT"O":POKE198,2:POKE631,19:POKE632,13J

```

MACHINE CODE DATA

```

00C4F0005000502F01E0501F01105020A0FF1E02F02B0A00C0FFD002C000B10200# 304
01C0FF0002C00040A0009100E50040A500C900D002E00160C0D0E0FA040100001# 346
02A001C906300160A9905001A90005000010900EA91B0046A200060000002A21E00# 375
03010500D0A0A919A0F9100EA910A00C00E0E01FF000A00000F230402070172000# 373
0414A900CC0CE0E0100000100010A0100010C01030101010010010100001010000# 205
0502010100040101000020102000201010001010100040101000201000000010100# 45
060101000002010100040101000101000001010100040101000001050001010100# 47
070001010001010400040101000201010002010500000101000001020000010100# 57
0801010000020111000201010002010100110102000020114000001010007010100# 40
090701010001010100000107000101070001010100010101000001010000010300# 52
100201010001010100010101000A01000001010100010101000001000000010100# 50
110101010001010100020101000001010000010300040101000101010001010100# 34
120201010000010100050100000101030002010500000105000401010013012000# 74
13100053011101200130012001070120011F16200D1F0120051F0220011F042001# 200
141F0220021F0220011F0120011F0420011F0220051F0620011F0120061F022001# 183
151F0420011F0120061F0120011F0420011F0220051F0120011F0620011F012004# 185
161F0220031F0120021F0120051F0620011F0620021F0620011F0120061F022001# 192
171F0220011F0220011F1120021F02200141F0320011F0720011F0720011F012001# 183
181F0320071F0120071F0120011F0120011F0320011F0520031F0520011F012001# 186
191F0120011F0320011F0620031F0120011F0120011F0220091F0620011F012001# 180
201F0120011F0220011F0320011F0320031F0420011F0120011F0120011F022001# 171
211F0320011F0520061F0120031F0220051F0320051F0420011F13004201000001# 194
2200010A010A010C01030101010101070001010A000201140000010500000100# 129
230002010C06110105000001050000010C000001030000010C0000010300000103# 134
240001010000000103000101100000010300010110000001030001011000000114# 101
25000201140002010512010100000114000201050001010A000F010700020100# 132
260001010A001701200100053011D01200130012001070120011F1620091F01200# 199

```

## Program Listing 2 (cont.)

```

270A1F0220141F0220051F0620091F02200C1F0F20071F0120061F03200C1F01200# 242
28041F0120011F03200C1F0120041F0120011F0320031F0120081F0620011F03200# 197
29031F0120101F0220031F0120101F0220031F0120101F0220141F0220141F02200# 179
30011F1220011F0220141F0220091F0120061F0220091F0120011F0220071F02200# 202
31091F01200A1F1720425F0000010020000100010C010301010104100114040201# 165
321404020104040101000403010104020103040201040403010004020114040301# 99
330E0407010204070106040101040402010F040101040402011404020102040101# 113
340504010103040501050401010304020102040101050401010304020114040201# 110
3514040C0106040101030402010104010107040301040401010304020101040201# 94
360D04010103040201140417012C04160053011D01200130012001070120011F16# 181
3720141F0220141F02200A1F01200B1F0320011F0220031F0220041F0320081F02# 202
3820141F02200F1F0120041F02200F1F0120041F02200F1F0120041F0220141F02# 224
3920021F0120051F01200B1F0220021F0120051F0120031F0220021F0120051F01# 197
40200B1F0220141F0220141F0220101F0120031F0220011F0120071F0320041F01# 195
4120031F0220011F02200D1F0120031F0220141F17204201000001000100010C01# 170
420C01030101010210011402020114020201140202011402020114020201140202# 80
430114020201140202011402020114020201140202011402020114020201140202# 80
4401140202011402020114020201140217012C02160053011D0120013001200107# 152
450120011F1620141F0220141F0220141F0220141F0220141F0220141F0220141F# 200
460220141F0220141F0220141F0220141F0220141F0220141F0220141F0220141F# 200
470220141F0220141F0220141F1720421C2240564C201E001024427E424242007C# 245
4822223C22227C001C22404040221C0070242222223470007E40407040407E007E# 244
494040704040400001C22404E42221C004242427E424242001C00000000001C000E# 234
50040404044430004244407040442004040404040407E0042645F004242420042# 211
516252404642420010244242422410007C42427C404040001024424240241F007C# 230
5242427C404442003C42403C02423C003E0000000000000042424242423C0042# 242
5342422424101000424242505046420042422410244242002222221C000000007E# 223
5402041020407E003C20202020203C000C10103C10706E003C04040404040C0000# 189

```

# Program Listing 2 (cont.)

```

55001C2000000000FFFFFFFFFFFF0000000000000000113EEDEC3E180110# 426
56100C067E3C066C300007C37377C0600C3663C7E663C18180C1C3C108C04040430# 403
574048304F4430000400100000000000040010101000040020100000010200000# 140
58201C3E1C2000000000003E0000000000000000000100000007E0000000000# 162
59000000001010000000400102040003C42403A62423C000010200000003E0000# 197
6042000C30407E000C42021C02423C00040C14247E0404007E407004024430001C# 241
6120407C42423C007E420408101010003C42423C42423C003C42423E0204300000# 224
62000000000000000000000000000000000000000000000000000000000000# 140
63100C060C1053504143432047414D45# 126

```

# Program Listing 3

```

4 H=36876
5 POKE32,22:POKE56,22:POKE51,17:POKE55,17
10 SY=073:POKEH+2,15:POKE36869,255:POKEH+3,150
30 DIMR(3),B(3),C(4):R(0)=33:R(1)=34:R(2)=35:R(3)=36:C(1)=5650:
C(2)=5732:C(3)=5750
40 C(4)=5756:B(0)=1:B(1)=22:B(2)=1:B(3)=22:D=7955:H=5:L=1:GOSUB400
50 GOSUB500:GOSUB550
60 PRINT"###SCORE":G:PRINTTAB(14)"LIVES":H
65 PRINT"###LEVEL":L:PRINTTAB(14)"FLAGS":F
120 C=PEEK(197)
125 IF1=0ANDST=160RC=32THENI=1
135 IFST=40RC=20THENE=E+1:IFE=-1THENE=3
140 IFST=00RC=44THENE=E+1:IFE=4THENE=0
150 POKED,32:POKE30720=D,0:IFI=0THEN170
160 D=D+E(E)
162 IFFPEEK(D)=31THENH=H-1:D=7955:I=0:GOSUB200:IFH=0THEN00T0230
164 IFFPEEK(D)=37THENC=5+F#F:GOSUB220:F=F+1:IFF=9THEHL=L+1:00T0300
170 POKED,RC):POKE30720=D,1
175 FORJ=1TOH:NEXT
180 00T060
200 FORJ=1TO10
202 POKEN+1,255-J#10
204 POKEN-12,11:POKEN-11,35:GOSUB500
206 POKEN-12,13:POKEN-11,41
210 NEXTJ:POKEN+1,0:POKEN-12,12:POKEN-11,30:RETURN
220 POKEN,255:FORJ=1TO10:NEXT:POKEN,0:RETURN
230 FORJ=1TO4:PRINT"#####
232 PRINTTAB(6)"GAME OVER
234 POKEN,255:GOSUB500
236 PRINT"#####
238 PRINTTAB(6)"GAME OVER":POKEN,120
241 GOSUB500:NEXT:POKEN,0

```



## Program Listing 1 (cont.)

```

244 POKE190,0:PRINTTRAC(5)"HIT A KEY"
245 GETTR:IFTR=" "THEN245
246 CLR:RUN
266 FORJ=1TO10
265 POKE1,128+J*10
267 FORJ1=1TO10-NEXTJ1
310 NEXTJ
315 FORJ=18TO1STEP-1
320 POKEH,255-J*10
323 FORJ1=1TO10-NEXTJ1
324 NEXTJ-POKEH,0
325 PRINTCHR$(19)
330 I=0:F=0:D=7555:G=0+L*100:IFL=5THENL=1:H=H-50:G=0+1000
340 GOTO55
400 PRINT"D    SKILL LEVEL"
405 PRINT"###10-EXPERT"
407 PRINT"###20-AVERAGE"
410 PRINT"###30-ADVANCE"
412 GETTR:IFTR="1"ORTR="3"THEN412
414 H=VAL(CHR$(50)):RETURN
500 FORQ=1TO100-NEXTQ:RETURN
508 SYS$(CL):POKE8185,31:POKE80905,0:RETURN
550 FORJ=1TO9:READK:POKEK,37-POKE30720+K,2:NEXT-RESTORE:RETURN
590 DATA7778,7788,7793,7890,7905,8015,8115,8131,8143

```

## Machine Code Loader

```

5 HI=22:LO=17
10 P=HI*256+LO
20 PRINT"NEXT LINE":INPUTTR
30 IFTR="SAVE"THEN300
35 IFTR="LOAD"THEN300
40 IFTR="END"THENEND
50 T=VAL(LEFT$(TR,2)):C=0:E=0:J=0
60 H=ASC(MID$(TR,J,1)):H=ASC(MID$(TR,J+1,1)):J=J+2
63 IFH=42THEN100
65 IFH=42THEN110
70 COSUB150:D=H*16/H=H/COSUB150:D=D+H
80 POKEP+TR*2+E,D-E+1:IFC32THEN400
100 IFC=VAL(LEFT$(TR,2))THEN20
110 PRINT"ERROR. RE=INPUT":PRINTTR:INPUTTR:GOTO30
150 H=H-48:IFH=9THENH=H-7
160 C=C+H:RETURN
200 COSUB205:GOTO220
205 PRINT"POSITION TIME THEN":PRINT"PRESS A KEY"
207 GETTR:IFTR=" "THEN207
208 POKE780,1:POKE781,1:POKE782,1:SYS63465
210 POKE780,2:POKE781,20:POKE782,1:POKE275,68:POKE277,77:SYS63469:RETURN
220 POKE780,0:SYS63469:GOTO205
300 COSUB205:POKE251,LO:POKE252,HI:POKE780,251:POKE781,0:POKE782,30
:SYS63465:GOT 020

```

# E-TOP DRAW



**Allen Webb produces some more routines to add a little spice to your programs.**

IN THE LAST PART OF THIS SERIES, I described how you could get interesting effects by manipulating predefined characters. This month, I want to cover some ways of producing some effects using fills and flashes. These effects are of value when you want to move from one display to another in an interesting way.

Most of you will have seen the screen effects used by some of the fast load programs available. The effect is to fill the screen, border or both with multicoloured stripes. By changing the delays, the width of the stripes can be altered. Loader 1 gives a simple routine which will give such an effect. Demo 1 shows what it can do. You can vary a number of parameters. Location 831 holds the delay parameter. This decides the width of the lines. (A value of 1 will give lines of about half a millimetre in width). You can specify the duration of the effect by putting the number of loops in location 839 and 838 (high byte in 839). Finally, location 832 holds a flag. A value of 7 limits the effect to the border, 2

flashes the screen and any other value flashes both.

In arcade type games, greater interest is created if you can use an interesting method of changing from one screen to the next. This can be as complex as you like, but one thing they do show is that the programmer has taken time to deal with the minor details. Loader 2 gives a trivial fill routine. This routine simply fills the screen with a specified character (in location 839) of a specified colour (in location 838). You can vary the speed from very slow to instantaneous by changing location 831.

A more interesting variant is given by Loader 3. This is a random fill. The parameters available are character (location 903), number of loops (location 905), colour flag (location 931). 0 gives multicolour, 1 uses colour in location 932. The number of loops can be changed to give a part fill. A value of 44 will completely fill the screen, a lower value will not. A value above 44 will simply give a pretty effect. This sort of effect is used in *Impossible Mission* to signify that you have failed the complete game. Using certain characters in this way can give some intriguing effects.

Loader 4 gives a more useful fill. This routine slowly fills an area of screen from top to bottom. To give smooth motion, the standard Commodore characters are

used to fill in two pixels at a time. The effect is similar to a shutter slowly sliding down over a window. Got the idea? As usual, I've provided a number of tweakable parameters. The start line, top line is 1, is poked into 907. The end line plus 1 is poked into 908. Two delay parameters are put into 909 and 910. The value in 909 is a coarse tweak and 910 a fine adjustment. The colour of the fill goes into 906. Again, this sort of effect is used in *Impossible Mission*.

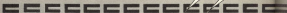
All of these routines occupy the spare area between the BASICs so no precautions are necessary to protect them from corruption. They occupy different areas so that they can cohabit. The routines use common areas of zero page memory, but no conflict should occur.

Clearly the range of effects available is huge, but when it comes down to it, they are based on similar concepts to those above. I've deliberately limited myself to simple routines for two reasons. First they are short meaning that they take up less RAM and they're easier for you to type in. Secondly, by allowing you to specify the operating parameters, complex effects are never-the-less possible.

Next month I will be applying myself to the problem of raster interrupts. Using my routine, you will have complete control over fifty points on the screen allowing complex graphical effects.

```

0 REM LOADER 1
1 REM
2 REM FLASH ROUTINE
3 REM
10 DATA 69,8,141,68,3,174,68,3,189,63,288,172,64,3,192,2,248,3,141,32,288
20 DATA 192,1,248,3,141,33,288,32,76,288,232,224,16,288,220,288,61,3,173,61
30 DATA 288,212,173,62,3,248,6,284,62,3,76,8,288,94,172,63,3,136,288,253
40 DATA 96,2,3,4,5,6,7,8,9,8,13,14,18,6,7,8,9,13
50 REM
60 FOR I=51200 TO 51279
70 READ K: T=T+K
80 POKE I,K
90 NEXT I
100 IF T<7242 THEN PRINT"DATA ERROR"
```



```

1 REM DEMO 1  FLASH ROUTINE
2 REM
10 PRINTCHR$(147);CHR$(13)
20 HC=1000:DE=25:FL=0:GOSUB130
30 PRINT"WOASN'T THAT APPALLING?"
40 PRINT"PRGHT"HELL THING CAN BE WASTIER...HOW ABOUT THIS...."
50 DE=1:HC=1000:GOSUB130
60 PRINT"PRINT"OK, IF THAT MAKES YOUR SYNAPSES TWITCH THIS IS A LITTLE GENTLER"
70 HC=1000:DE=225:GOSUB130
80 PRINT"PRINT"YOU CAN HEAR JUST THE BORDER...."
90 FL=1:HC=200:FOR DE=1TO60STEP3:GOSUB130:NEXT
100 PRINT"PRINT"OR JUST THE SCREEN...."
110 FL=2:HC=200:FOR DE=1TO60STEP3:GOSUB130:NEXT
120 END
130 POKESB9,INT(HC/256):POKES29,HC-POKESB9*256:POKES32,FL
140 POKES31,DE:SYS(200)
150 REM 30=DELAY 1...REM, 225 REM
160 REM HC=NO OF LOOPS
170 REM FL=FLAG, FL=1...BORDER FL=2...SCREEN FL=3...BOTH
180 RETURN

```



```

1 REM
2 REM LOOPER 2
3 REM
4 REM SLOW FILL
5 REM
10 DATA 9,130,200,173,63,9,130,200,253,96,169,8,133,251,169,4,133,252,169
20 DATA 8,133,253,169,216,133,254,169,8,173,66,9,145,251,173,65,3,145,253,165
30 DATA 251,24,185,1,133,251,165,252,185,8,133,252,165,253,24,185,1,133,253
40 DATA 165,254,185,8,133,254,32,133,260,165,251,291,232,260,289,165,252,261
50 DATA 7,225,283,96,8
60 REM
70 FOR I=51200TO51400
80 READ T:T=T-K
90 POKET,I
100 NEXT
110 IF T<11563 THEN PRINT"DATA ERROR"

```

```

1 REM LOADER 3
2 REM
3 REM RANDOM FILL
4 REM
10 DATA169,8,141,132,3,141,133,3,32,55,262,92,91,262,173,132,3,165,1,141,132
20 DATA3,173,133,3,165,8,141,133,3,265,152,3,269,233,96,24,168,41,162,5,152
30 DATA168,142,3,125,142,3,157,142,3,262,18,243,96,169,8,162,6,157,142,3,262
40 DATA6,259,96,173,142,3,133,251,133,253,173,143,3,41,3,9,4,133,252,24,165
50 DATA12,133,254,32,96,262,96,32,667,262,168,8,173,134,3,145,251,173,133
60 DATA3,248,5,173,134,3,76,117,262,173,144,3,41,15,145,253,96,8
70 REM
80 FOR I=517127055632
90 READ X: T=T+X
100 POKEI,X
110 NEXT
120 IF T<13181 THEN PRINT"DATA ERROR"

```

```

1 REM DEMO 2: RANDOM FLASH
2 REM
10 POKE328,44:POKE362,51:POKE321,8:POKE322,1:SV55712
20 REM 502....CHRR
30 REM 508....NO LOOPS...44 FILLS SCREEN COMPLETELY
40 REM 521....FLAG 8=MULTI COLOUR
50 REM .....1=HIGHCHROME
60 REM 522....COLOUR

```

```

1 REM LOADER 4
2 REM
3 REM TWO PIXEL FILL
4 REM
10 DATA169,8,141,132,3,169,4,141,133,3,32,137,261,173,139,3,141,136,3,175
20 DATA332,3,136,251,136,253,173,179,3,139,252,24,165,212,133,254,32,92,261
30 DATA236,136,3,173,136,3,265,148,3,248,26,24,173,132,3,165,48,141,132,3
40 DATA73,133,3,165,8,141,133,3,76,19,261,96,168,8,173,137,3,145,251,173
50 DATA139,3,145,253,269,192,48,269,241,32,114,261,96,162,6,169,169,261,141
60 DATA137,3,32,71,261,232,224,5,269,242,96,119,128,236,239,168,72,136,72
70 DATA152,72,173,141,3,174,142,3,262,269,253,136,266,247,184,168,184,178
80 DATA184,96,173,139,3,192,1,248,21,136,173,132,3,24,165,48,141,132,3,173
90 DATA133,3,165,8,141,133,3,136,268,236,96,8
100 REM
110 FOR I=51495 TO 51625
120 READ X: T=T+X
130 POKE I,X
140 NEXT
150 IF T<26665 THEN PRINT"DATA ERROR"

```

```

1 REM DEMO 3: TWO PIXEL FILL
2 REM
10 POKE366,3: REM COLOUR
20 POKE 367,3: REM START POSITION
30 POKE 368,24: REM END POSITION+1
40 POKE 369,48: REM OUTER DELAY LOOP
50 POKE370,48: REM INNER DELAY LOOP
60 SV531436

```



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